

**HSCC (India) Limited  
as Executing Agency on behalf of  
MINISTRY OF HEALTH & FAMILY WELFARE,  
NEW DELHI**

**TENDER**

**FOR  
Construction of Hospital and Academic  
Campus  
at  
All India Institute of Medical Sciences  
Mangalagiri Distt. Guntur (AP)**

**under**

**Pradhan Mantri Swasthya Suraksha Yojana  
(PMSSY)**

**VOLUME – I**

**Notice Inviting Bids & Instructions to Bidders**

**JANUARY 2018**

**Executing Agency**



**HSCC (INDIA) LTD.**

**E-6(A), sector-1, NOIDA(U.P) 201301 (India)**

**Phone : 0120-2542436-40**

**Fax : 0120-2542447**

**Tender No. HSCC/PMSSY/AIIMS/Guntur/H&A/2018**

**GOVERNMENT OF INDIA  
MINISTRY OF HEALTH & FAMILY WELFARE**

22-01-2018

**Notice Inviting e-Tender**

HSCC (India) Limited as Executing Agency on behalf of **Ministry of Health & Family Welfare, Government of India** invites online percentage rate bids **through e-tendering** from eligible contractors/firms for the following works under **Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)** :

| Name & Description of work   | Estimated cost (Rs.) | Tender available online and Last date to fill/upload the tender through e-Tendering. | Bid Security amount (in Rs.) |
|--|----------------------|--|------------------------------|
| 1.Tender no: HSCC/PMSSY/AIIMS/Nagpur/H&A/2018 : Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Nagpur (Maharashtra)            | Rs.555.72 crore      | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs. | Rs.5.66 crore                |
| 2.Tender no: HSCC/PMSSY/AIIMS/Guntur/H&A/2018 : Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri, Distt. Guntur (AP) | Rs.556.99 crore      | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs. | Rs.5.67 crore                |
| 3.Tender no: HSCC/PMSSY/AIIMS/Kalyani/H&A/2018 : Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Kalyani (West Bengal)          | Rs.600.78 crore      | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs. | Rs.6.11 crore                |

The above works also includes Internal Electrification, HVAC, PHE, Fire-fighting, external development works etc. and their Maintenance during Defect Liability Period. Overall completion period of each work shall be 22 calendar months with a phased completion of various buildings/works. Please refer detailed NIT on <http://www.hsccltd.co.in> , CPP Portal <http://eprocure.gov.in> , MoHFW website <http://pmssy-mohfw.nic.in/Tender.aspx> and HSCC e-tender portal <http://www.tenderwizard.com/HSCC> for details regarding submission, pre bid conference, completion period of various building under each work & other tender details.

HSCC reserves the right to accept or reject any application without assigning any reason or incurring any liability whatsoever.

Prospective bidders are advised to regularly scan through HSCC e-tender portal <http://www.tenderwizard.com/HSCC> and <http://www.hsccltd.co.in> as corrigendum/amendments etc., if any, will be notified on these websites only and separate advertisement will not be made for this.

**Chief General Manager  
HSCC (India) Limited**

**HSCC (India) Limited**  
**as Executing Agency on behalf of**  
**MINISTRY OF HEALTH & FAMILY WELFARE,**  
**Government of India, New Delhi**

**NOTICE INVITING e-TENDER (Detailed NIT)**

Tender No. HSCC/PMSSY/AIIMS/Guntur/H&amp;A/2018

Dated 22-01-2018

HSCC (India) Limited as Executing agency on behalf of Ministry of Health & Family Welfare (MoHFW), Govt. of India, New Delhi invites on line Percentage Rate bids through e-tendering from eligible contractors/firms for the following works under Pradhan Mantri Swasthya Suraksha Yojna, (PMSSY):

| Name and Description of work   | Estimated cost (Rs.) | Completion period of Work (Months)  | Last date to fill/upload the tender through e-Tendering.                              | Bid Security amount (Rs.) |
|--|----------------------|---|---|---------------------------|
| Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Guntur (Andhra Pradesh) | Rs.556.99 crore      | 18 Calendar Months for all buildings of the Academic Campus, including completion of all services (within the scope of this tender) required for making these buildings operational<br><br>22 Calendar Months for all other buildings and works | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs.. | Rs.5.67 crore             |

The above works also includes internal electrification, HVAC, PHE, fire fighting, external developments works etc. and their maintenance during Defect Liability Period. Time of completion for the entire work shall be 22 calendar months. However, the Period of completion for all buildings of the Academic Campus, i.e., Medical College, Nursing College, Admin Block, Library, shall be 18 months, including completion of all services (within the scope of this tender) required for making these buildings operational.

The bidder would be required to register at HSCC e-tender portal <http://www.tenderwizard.com/HSCC>. The bid document is available online from 24-01-2018. The bidder is required to have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities for submission of the bids. The bidders are required to submit (a) Original non-refundable Demand Draft of Rs.25,000/- (Rs. Twenty Five Thousand only) as cost of bid, in favour of "HSCC (India) Limited", payable at Noida/New Delhi (b) Original bid security in approved form as detailed in Vol.I of Tender documents to the office of Chief General Manager, HSCC (India) Limited E-6(A), Sector 1, Noida – 201301 before date and time fixed for opening of bid either by registered post or by hand failing which the bid be declared non-responsive.

The documents to be uploaded online are listed at Annexure I

The complete set of Tender Documents comprising six Volumes I, II, III, IV, V & VI has been made available at e-tender portal <http://www.tenderwizard.com/HSCC>.

The interested applicant contractors/firms may like to attend the pre bid meeting which will be held at 15:30 hrs at Corporate Office of HSCC (India) Limited, E-6(A), Sector 1, Noida on 30-01-2018.

HSCC (India) Limited reserves the right to accept or reject any application without assigning any reason or incurring any liability whatsoever.

Prospective bidders are advised to regularly scan through HSCC e-tender portal <http://www.tenderwizard.com/HSCC> and <http://www.hsccltd.co.in> as corrigendum/amendments etc., if any, will be notified on this portal only and separate advertisement will not be made for this.

Chief General Manager,  
HSCC (India) Limited as Executing Agency  
on behalf of Ministry of Health & Family Welfare,  
Govt. of India

## DISCLAIMER

This document has been prepared by HSCC (I) Ltd as Executing Agency on behalf of Ministry of Health & Family Welfare, (MoHFW), Govt. of India. The information is provided to prospective Bidders, who are interested to Bid for **Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri, Distt. Guntur (AP).**

This document is neither an agreement, nor an offer or invitation to perform work of any kind to any party.

The purpose of this document is to provide interested parties with information to assist the preparation of their Bid. While due care has been taken in the preparation of the information contained herein, and believe it to be complete and accurate, neither any of their authorities or agencies nor any of their respective officers, employees, agents or advisors give any warranty or make any representations, expressed or implied as to the completeness or accuracy of the information contained in this document or any information which may be provided in association with it.

Further, HSCC (I) Ltd (*Executing Agency*) does not claim that the information is exhaustive. Respondents to this document are required to make their own inquiry/ survey and will be required to confirm, in writing, that they have done so and they did not rely solely on the information given herein.

HSCC (I) Ltd (*Executing Agency*) reserves the right not to proceed with the Project or to change the configuration of the Project, to alter the timetable reflected in this document or to change the process or procedure to be applied. It also reserves the right to decline to discuss the Project further with any respondent.

No reimbursement of cost of any type or on any account will be made to persons or entities submitting their Bid.

**INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR E-TENDERING FORMING PART OF BID DOCUMENT**

Chief General Manager, HSCC (India) Limited as Executing Agency of Ministry of Health & Family Welfare, (MoHFW), Govt. of India, New Delhi invites on-line percentage Rate bids through e-tendering from eligible contractors/firms for the following works under Pradhan Mantri Swasthya Suraksha Yojna, (PMSSY):

| Name and Description of work  | Estimated cost (Rs.) | Bid Security amount (Rs.) | Completion period of Work (Months)  | Last date to fill/ upload the tender through e-tendering                              | Time and Date of Opening of Technical Bid |
|---|----------------------|---------------------------|---|---|---|
| Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (AP) | 556.99 crore         | 5.67 crore                | 18 Calendar Months for all buildings of the Academic Campus, including completion of all services (within the scope of this tender) required for making these buildings operational<br><br>22 Calendar Months for all other buildings and works | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs.. | 06-02-2018 at 15:30 hrs.                  |

1. Contractor who fulfill the following requirements and having bidding capacity as per requirement of clause 1.4 (i) of Vol 1, shall be eligible to apply. Joint ventures are not accepted.

a. Should have satisfactorily completed the works as mentioned below during the **last seven years** ending previous day of last date of submission of bids.

i. Three similar works each costing not less than Rs.222.80 Crores,

or

two similar works each costing not less than Rs.334.19 Crores,

or

one similar work costing not less than Rs.445.59 Crores

**Similar Work** shall mean works of *“Project comprising Construction of any Institutional multistoried RCC framed structure building like Hospitals, Hotels, Airports, Large offices, etc. minimum Five storeys above ground level (basement, machine room and mummy shall not be counted as a storey) including finishing works, internal water supply, sanitary installations, internal electrical installations,*

***Fire Fighting works and Centralized HVAC works, all executed under one composite agreement"*** all executed under one composite agreement.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of tenders.

- b. Should have had average annual financial turnover of **Rs. 278.49 Crore** on construction works during the last three years ending 31<sup>st</sup> March 2017 (Scanned copy of Certificate from CA to be uploaded).
  - c. Should not have incurred any loss in more than two years (profit after tax should be positive) during the last five years ending 31<sup>st</sup> March 2017
  - d. Should have a solvency of **Rs. 222.79 Crore** (Scanned copy of original solvency to be uploaded).
2. The intending bidder must read the terms and conditions of Notice Inviting Bids and the Bid documents carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required. All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even in no information is to be provided in a column, a “nil” or “no such case” entry should be made in that column. If any particulars/query is not applicable in case of the bidder, it should be stated as “not applicable”. The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms may result in the bid being summarily disqualified.
  3. Information and Instructions for bidders posted on website shall form of bid document.
  4. The document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website <http://www.tenderwizard.com/HSCC> free of cost.
  5. But the bid can only be submitted after uploading the mandatory scanned documents such as Demand Draft or Pay order or Banker’s Cheque and bank guarantee of any Scheduled Bank towards cost of bid document and EMD in favour “**HSCC (India) Limited**”, payable at Delhi/Noida (*Executing Agency*),” as per details given in the Bid Document and Processing Fee via online mode only and other documents as specified.
  6. Those bidders not registered on the website mentioned above are required to get registered beforehand. If needed, they can be imparted training on online bidding process as per details available on the website.
  7. The intending bidder must have valid class-III digital signature to submit the bid.
  8. On opening date, the contractor can login and see the bid opening process.
  9. Contractor can upload documents in JPG format or PDF format.

10. **Certificate of Financial Turnover:** At the time of submission of bid, contractor should upload Affidavit/ Certificate from CA mentioning Financial Turnover of last 3 years or for the period as specified in the bid document and the relevant pages of the profit and loss statement and balance sheet from the annual report.
11. Contractor must ensure to quote rate of each item. The column meant for quoting rate in figures appears in pink colour and the moment rate is entered, it turns sky blue. In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as "0". Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (**ZERO**).
  - a. If a tenderer quotes nil rates against each item in item rate tender or does not quote any percentage above/below on the total amount of the tender or any section/sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
12. The Technical bid shall be opened first on due date and time as mentioned above. The time and date of opening of financial bid of contractors qualifying the technical bid shall be communicated to them at a later date.
13. Pre Bid conference shall be held in the Office of HSCC (India) Limited at E-6(A), Sector 1, Noida – 201 301 on 30-01-2018 at 15:30 hrs to clear the doubt of intending bidders, if any.
14. When bids are invited in three stage system and if it is desired to submit revised financial bid then it shall be mandatory to submit revised financial bid. If not submitted then the bid submitted earlier shall become invalid.
15. The MoHFW reserves the right to reject any prospective application without assigning any reason and to restrict the list of qualified contractors to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.

- Sd -

Chief General Manager,  
HSCC (India) Limited  
as Executing Agency on behalf of  
Ministry of Health & Family Welfare,  
Govt. of India

***HSCC (India) Limited*****List of Documents to be scanned and uploaded within the period of bid submission:**

- i. Demand Draft/Pay order or Banker's Cheque /Bank Guarantee of any Scheduled Bank against EMD.
- ii. Demand Draft/Pay order or Banker's Cheque of any Scheduled Bank towards cost of Bid Document.
- iii. Form of Bid and Appendix (Form A) and Form A appendix.
- iv. Power of attorney (Form E) in favour of the person signing the bid.
- v. Affidavit / Undertaking for engaging specialized agencies- (Form H)
- vi. Affidavit by Bidder (Form K)
- vii. Form "T-1" (Financial Information- Annual Financial Statement for the last Five Years)
- viii. For "T-1-B" (Solvency certificate form a scheduled Bank)
- ix. Form "T-2" (List of all works of similar nature successfully completed during the last seven years)
- x. Form "T-4" (Performance Report of works)
- xi. Form "T-5" (Structure and Organization)
- xii. Certificate of Registration for GST and acknowledgement of up-to-date file return.
- xiii. Copy of GST Registration or undertaking in this regard as per clause 1.27
- xiv. Undertaking as per requirements of clause 1.28 (as per format Form M)
- xv. Integrity pact & Agreement duly signed by the person authorized to sign the bid on behalf of the bidder (As per performa given in GCC volume-II).



## DEFINITIONS

1. **“Application”** shall mean the response submitted by interested parties.
2. **“BID/Tender”** shall mean documents issued by HSCC (India) Limited to the prospective Bidder. The word **“Tender”** is synonymous with **“Bid”**.
3. **“Bid Security/ Earnest Money”** shall mean the amount to be deposited by the Bidder with the Tender.
4. **“Bid Validity”** shall mean the period for which the Bids shall remain valid.
5. **“Bidder”** shall mean the party participating in the Tendering process pursuant to and in accordance with the terms of this document. The word **“Tenderer”** is synonymous with **“Bidder”**.
6. **“Contract Agreement”** shall mean the agreement to be signed between the Successful Tenderer and the competent authority of HSCC (India) Limited/ their authorized representative.
7. **“Contract Price”** shall mean the financial bid of the Successful Tenderer as accepted by the Client.
8. **“Date of commencement of work”** shall mean the date of Start as specified in the Schedule “F” or the date of handing over of the site, whichever is later in accordance with the phasing if any, as indicated in the tender document.
9. **“Defects Liability Period”/“Maintenance Period”** means the period after completion of the Project during which the MoHFW or his authorized representative / Engineer-in-charge/Executing Agency that will notify to the Contractor any defect noticed in the work and the Contractor is liable for rectification of such defects. Proof of dispatch of letter notifying the defect/ intimating the representative of Contractor at site on the last date of Defect liability period will make the Contractor liable for rectify all such defects.
10. **“Engineer in Charge” (EIC)** means the Engineer Officer as mentioned in the schedule “F” hereunder, as authorized by HSCC (India) Limited..
11. **“Evaluation Committee”** shall mean the committee constituted by HSCC (India) Limited for the evaluation of the bids.
12. **“HSCC (India) Limited”/“HSCC”** shall mean HSCC (India) Limited, having its corporate office at E-6(A), Sector 1, Noida – 201 301 appointed by Ministry of Health & Family Welfare, Government of India as a Executing Agency for the project..
13. **“Letter of Award”** shall mean the letter issued by the HSCC (India) Limited to the Successful Tenderer inviting him to sign the Contract Agreement.
14. **“Performance Guarantee”** shall mean the amount to be paid by the Successful Tenderer as per relevant clause mentioned elsewhere.

15. **“Processing Fee”** shall mean the amount to be paid by the Tenderers in consideration of cost of bid document.
16. **“Project”** shall mean Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri, Distt. Guntur (Andhra Pradesh) including internal electrification, HVAC, PHE, fire fighting and external developments works etc. and their Maintenance during Defect Liability Period
17. **“Site”** shall mean the place where the works under the Project are to be carried out and the details of which are provided in this document.
18. **“Successful Tenderer”** shall mean the Tenderer declared technically and financially successful for the Project and with whom, the Contract Agreement shall be signed.
19. **“Similar Works”** as defined in eligibility criteria.
20. **“Scheduled banks”** mean **“Scheduled commercial Banks”**
21. **“Employer/Principal Employer”** means **HSCC (India) Limited as executing agency on behalf of Ministry of Health & Family Welfare, Government of India.**
22. **“NIT”** means **Notice Inviting Tender.** The word **“Notice Inviting Tenders”** is synonymous with **“Notice Inviting Bids”**.
23. **“ITB”** means **Instructions to Bidders**
24. **“PMSSY”** shall mean **Pradhan Mantri Swasthya Suraksha Yojana.**
25. **MoHFW** shall mean **Ministry of Health & Family Welfare.**

**NOTICE INVITING BIDS**  
***HSCC (India) Limited***  
**As executing agency on behalf of**  
**Ministry of Health & Family Welfare,**  
**Government of India, New Delhi**

1. The Chief General Manager, HSCC (India) Limited invites on line Percentage Rate tenders as executing agency on behalf of Ministry of Health & Family Welfare, (MoHFW), Govt. of India, New Delhi from eligible contractors through e-tendering as per eligibility criteria laid down, for the work of **“Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (Andhra Pradesh) including internal electrification, HVAC, PHE, fire fighting, external development works etc. and their Maintenance during Defect Liability Period”**.

1.1. The work is estimated to cost as given in Table - I. Chief General Manager, HSCC (India) Limited, E-6(A), Sector 1, Noida – 201 301 will deal all the matters relating to invitation of tenders. Any clarification shall be sought from Chief General Manager, HSCC (India) Limited on courier/fax no.0120-2542447. The NIT and other details are also available on the HSCC e-tender portal <http://www.tenderwizard.com/HSCC>.

1.2. Pre bid conference will held on 30-01-2018 at 15:30 hrs in the office of HSCC (India) Limited, E-6(A), Sector 1, Noida – 201 301 or any other venue as decided in future for which intimation will be published on web site. Chief General Manager, HSCC (India) Limited may also be contacted in this regard.

1.3. TABLE - I

| Name & description of work  | Estimated cost (Rs.) | Completion period of work (months)  | Last date to fill/upload the tender through e-Tendering.                              | Bid Security amount (in Rs.) | Cost of Tender (Tender Document Fee) (in Rs.) |
|---|----------------------|---|---|------------------------------|---|
| Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (Andhra Pradesh) | 556.79 crore         | 18 Calendar Months for all buildings of the Academic Campus, including completion of all services (within the scope of this tender) required for making these buildings operational<br><br>22 Calendar Months for all other buildings and works | From 24-01-2018 to 06-02-2018 upto 15:00 hrs and opening on 06-02-2018 at 15:30 hrs.. | 5.67 Crores                  | 25000/-                                       |

- 1.4. Intending bidder is eligible to submit the bid provided he has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude specified below:

**1.4.1. Eligibility Criteria**

The tenderer should meet the following minimum eligibility criteria:

Bidders who fulfill the following requirement shall be eligible to apply. Joint ventures of whatsoever kind are not accepted.

- (a) Experience should be in the name of the bidding company and not in subsidiary/ associate company/ Group Company etc. Experience as part of a Joint Venture shall not be considered.

- (b) (i) Experience of having successfully completed works during the last 7 years ending previous day of last date of submission of tenders

Three similar completed works each costing not less than the amount equal to Rs. 222.80 Crore (amount in Rupees of 40% of the estimated cost).

or

Two similar completed works each costing not less than the amount equal to Rs.334.19 Crore (amount in Rupees of 60% of the estimated cost).

or

One similar completed work of costing not less than the amount equal to Rs.445.59 Crore (amount in Rupees of 80% of the estimated cost).

\*“**Similar Works**” shall mean a Project comprising Construction of any Institutional multistoried RCC framed structure building like Hospitals, Hotels, Airports, Large offices, etc. minimum Five storeys above ground level (basement, machine room and mumty shall not be counted as a storey) including finishing works, internal water supply, sanitary installations, internal electrical installations, Fire Fighting works and Centralized HVAC works, all executed under one composite agreement.

Own works / work under the same management / own certification of the bidder shall not be considered for pre-qualification.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of tenders.

The past experience in similar nature of work should be supported by certificates issued by the client’s organization. In case the work experience is of Private sector the completion certificate shall be supported with copies of Corresponding TDS Certificates.

- (c) **Turnover:** Average annual financial turnover on construction works should be at least 50% of the estimated cost during the immediate last three consecutive financial year ending *31st March, 2017*. The turnover should be of the Bidding Company and not for Group Company or subsidiary company etc. Year in which no turnover is shown would also be considered for working out the average.
- (d) **Profit / loss:** The Company should have a positive Net Worth and should have incurred loss (profit after tax should be positive) in not more than Two years during the last Five years ending *31st March 2017*. This should be duly certified by the Chartered Account.
- (e) **Solvency Certificate:** Solvency of the amount equal to 40% of the estimated cost of the work duly certified by his bankers.
- (f) Direct / indirect Joint Ventures (JV)/ Consortium of any kind are not permitted.
- 1.5. The time allowed for carrying out the work will be *22 Calendar Months (Twenty Two Months)* from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing/ milestones, indicated in the tender documents.

Phasing :

- Phase I - 18 Calendar Months for all buildings of the Academic Campus, i.e., Medical College, Nursing College, Admin Block, Library, including completion of all services (within the scope of this tender) required for making these buildings operational
- Phase II - 22 Calendar Months for all other buildings and works

- 1.6. (i) The site for the work is available.

Or

~~The site of work shall be made available in parts as specified below:~~

.....

- (ii) The architectural drawings and structural drawings for the work is available

Or

The architectural drawings and structural drawings shall be made available in phase manner, as per requirement of the same as per approved programme of completion submitted by the contractor after the award of work.

- 1.7. The bid documents consisting of plans specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents is available on line from 24-01-2018 at HSCC e-tender portal <http://www.tenderwizard.com/HSCC> free of cost.

1.8. Last date to fill/upload the tender through e-Tendering is 06-02-2018 upto 15:00 hrs. Opening at 15.30 hrs on the same date, i.e., 06-02-2018.

1.8.1. The intending bidder must have class-III digital signatures to submit the bid. After submission of bid the contractor can re-submit revised bid any number of times but before the last time and the date of submission of bid as notified. While submitting the revised bid, the contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before the last time of date of submission of bids as notified.

1.9. Bid shall be accompanied with Earnest money of **Rs. 5.67 Crores** in shape of demand draft of a scheduled bank issued in favour of “**HSCC (India) Limited**” Payable at New Delhi/Noida or fixed deposit receipt or Banker’s cheque or Bank Guarantee in favour of “**HSCC (India) Limited**” as per Form B, having validity for six months or more from the last date of receipt of tenders or any extension thereof.

The earnest money amount in the form of demand draft or pay order or Banker’s cheque or Bank Guarantee shall be scanned and uploaded to the e-Tendering website within the period of bids submissions and original should be deposited in the office of Chief General Manager, HSCC (India) Limited at E-6(A), Sector 1, Noida – 201 301.

Interested bidders who wish to participate in the bid has also to make following payments in the form of Demand Draft / Pay order or Banker’s Cheque of any Scheduled Bank and to be scanned and uploaded to the e-Tendering website within the period of bids submission:

(i) Cost of bid Document – Rs. 25000/- “as mentioned in detailed NIT drawn in favour of “**HSCC (India) Limited**” Payable at New Delhi/Noida.

Demand Draft or Pay order or Banker’s cheque or Bank Guarantee against EMD and Cost of bid document shall be placed in single sealed envelope superscripted as “**Earnest Money and Cost of Bid Document**” with name of work and due date of opening of the bid also mentioned thereon and to be submitted in the office of **Chief General Manager, HSCC (India) Limited, E-6(A), Sector 1, Noida – 201301** the last date & time of submission of bid and upto 15:00 hrs on 06-02-2018. The documents submitted shall be opened at 15:30 hrs on the same day.

Online bid documents submitted by intending bidders shall be opened only of those bidders, whose Earnest Money Deposit and Cost of Bid Document and other documents placed in the envelope are found in order.

1.9.1. The bid submitted shall become invalid and cost of bid & e-Tender processing fee shall not be refunded if:

- (i) The bidder is found ineligible.
- (ii) The bidder does not upload all the documents (including GST registration) as stipulated in the bid document.
- (iii) If any discrepancy is noticed between the documents as uploaded at

the time of submission of bid and hard copies as submitted physically in the office of tender opening authority.

- 1.10. The tender comprising the Instructions to bidders, Technical Package Part-I, Technical Package Part-II and Financial Package as detailed in clause 2.3.6 and 2.3.7 of ITB shall be submitted online, each marked as per clause 2.3.12 of ITB upto 15:00 hrs on 06-02-2018 and will be opened on the same day at 15:30 hrs i.e. on 06-02-2018. “Technical Package Part-II” of only those tenderer(s), whose earnest money and Tender document fee placed in the other envelope (Technical Package Part I), are found to be in order, shall be opened.
- 1.11. The bidder, whose tender is accepted, will be required to furnish performance guarantee 5% (Five Percent) of the tendered amount within the period specified in Schedule F. This guarantee shall be in the form of fixed deposit receipt (FDR) or Banker’s Cheque or Demand Draft or Bank Guarantee of any scheduled commercial bank based in India, in favour of “**HSCC (India) Limited**” as per Form C. **Performance Bank Guarantee to be valid up to sixty days beyond the stipulated date of completion or the extended period, thereof.**
- 1.12. In case the contractor fails to deposit the said performance guarantee within the period as indicated in schedule ‘F’, including the extended period if any, the earnest money deposited by the contractor shall be forfeited automatically without any notice to the contractor.
  - 1.12.1. The contractor whose tender is accepted will also be required to furnish either copy of applicable licenses / registration or proof of applying for obtaining labour licenses, registration with EPFO, ESIC and BOCW welfare board and programme chart (time and progress) within the period specified in schedule F.
- 1.13. **Evaluation of performance :**

Evaluation of the performance of contractors for eligibility shall be done by HSCC. If required, the works executed by the bidders who otherwise qualify may be got inspected by HSCC or a committee or any other authority as decided by Client.
- 1.14. The description of the work is as follows: - The work involves “**Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (Andhra Pradesh) including internal electrification, HVAC, PHE, fire fighting, external development works etc. and their Maintenance during Defect Liability Period**”. Further details can be seen at HSCC e-tender portal <http://www.tenderwizard.com/HSCC> .
- 1.16. Copies of other drawings and documents pertaining to the works are available online for bidders at HSCC e-tender portal <http://www.tenderwizard.com/HSCC> .
- 1.17. Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall

themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The bidder shall be responsible for arranging and maintaining at its own cost all materials, tools & plants, water, electricity, access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

- 1.18. The Competent Authority for & on behalf of HSCC (*Executing Agency*) does not bind itself to accept the lowest or any other tender and reserves to itself the authority to reject any or all the tenders received without the assignment of any reason. All tenders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidder shall be summarily rejected.
- 1.19. Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
- 1.20. The competent authority on behalf of HSCC (*Executing Agency*) reserves to himself the right of accepting the whole or any part of the tender and the bidder shall be bound to perform the same at the rate quoted.
- 1.21. The contractor shall not be permitted to tender for works in case his near relative is Gazetted officer in Ministry of Health and Family Welfare or in the Managerial cadre of HSCC (*Executing Agency*) and is directly dealing with the Project PMSSY. Any breach of this condition by the contractor would disqualify him from participation and consideration in the tender process.
- 1.22. No Engineer of gazetted rank or other Gazetted officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.
- 1.23. The tender for the works shall remain open for acceptance for a period of **180 (ONE HUNDRED AND EIGHTY )** days from the LAST date of submission of bid or any extension thereto. If any bidder withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any



modifications in the terms and conditions of the tender which are not acceptable to the Department, then the Client shall, without prejudice to any other right or remedy, be at liberty to forfeit 100% of the said earnest money as aforesaid. Further the bidder shall not be allowed to participate in the re-tendering process of the work.

- 1.24. This is a Time Bound Project
- 1.25. The work includes a number of specialized Civil/Electrical/ Mechanical/ Electronic Engineering services etc. to be executed as integral parts of the project by engaging specialized agencies in each case meeting the eligibility criteria and after approval by the Engineer-in charge. The eligibility criteria for carrying out of specialized items of work through specialized agencies shall be as per given in CPWD Works Manual.

List of specialized works is as given in para 16.10 of CPWD works manual. The eligibility criteria for carrying out of specialized items of work through specialized agencies shall be as per given in CPWD Works Manual.

Some of the Specialized Services (if applicable) are: -

**List of specialized item / jobs for civil works**

- (1) Water proofing treatment work.
- (2) Aluminum doors and windows, aluminum partition.
- (3) Aluminum composite panel.
- (4) Water treatment plant.
- (5) Structural glazing work.
- (6) Signages.
- (7) PT Slab
- (8) Plumbing works
- (9) Fire Fighting Works

**List of specialized item / jobs for Electrical /HVAC/OT etc. work (As applicable)**

Supplying / fabrication, installation, testing, and commissioning of the following -

- (1) Sewage treatment plant.
- (2) HT and LT Switchgear.
- (3) Air- conditioning plant.
- (4) Lift, escalator and conveyors.
- (5) Simultaneous interpretation System.
- (6) Gas plant.
- (7) Transformer.

- (8) Diesel generating sets.
- (9) Water coolers.
- (10) Public address system; conferencing system, automatic vote recording system, recorders.
- (11) EPBAX system (equipments).
- (12) EPBAX system (cabling and wiring).
- (13) Security system and alarm.
- (14) Building automation system.
- (15) Digital display board.
- (16) Fire fighting equipment (including wet riser and sprinkler system, \*\*portable fire extinguishers), fire detection and alarm and any other co-related items.
- (17) Hydraulic platform/lift.
- (18) Incinerator.
- (19) Laundry equipment.
- (20) Energy conservation measures for lighting.
- (21) Centralized clock system.
- (22) Interior/exterior flood lighting of heritage/monumental buildings/structures involving computer aided design, and evolution of special mounting arrangements for luminaries.
- (23) Conservation measures for lighting.
- (24) Supply and installation of UPS System and Servo Voltage Stabilizers
- (25) Rising Mains / Bus Trunking in Buildings.
- (26) Gas Pipe line
- (27) Water supply motors and pumps of 100 hp or more
- (28) Mechanized Car Parking Systems
- (29) VRV/VRF Type Air-Conditioning Systems
- (30) Oxygen Generation Plant
- (31) CCTV and Allied Equipments
- (32) Access Control System
- (33) Hydro Preumatic Pumps
- (34) HVAC

1.26. This being a composite tender, the Bidder must associate with himself agencies otherwise eligible to tender for other components individually including

specialized services for which an affidavit/undertaking as per format enclosed at Form H should be submitted along with the Technical Bid.

- 1.27. Registration/ Licence: The firm should have GST Registration with the appropriate Authorities **In case the firm is not registered at the time of submission of bid, they will submit an undertaking that they will get themselves registered with the concerned authorities in case they are awarded the work**
- 1.28. The contractor/firm will indemnify HSCC (I) Ltd and MOHFW , as the case may be, against all penal action that may be levied/effected by any concerned authority for default in any labour regulation/PF/ESI and other statutory requirements of the relevant Acts/Laws related to the work of the contractor and will bear the legal charges, if any, and will pay the legal charges/dues directly to the concerned authority. An undertaking in this regard is required to be submitted by applicants along with prequalification.
- 1.29. This Notice Inviting bid shall form a part of the contract document. The successful Tenderer/ contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of :-
  - a) The Notice Inviting Bids, all the documents including General Conditions of the Contract, Specific Conditions of Contract, Specifications, Bill of Quantities and drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto including amendments, corrigendum etc. if any.

**Following shall also be part of the contract:**

Standard CPWD forms as mentioned in Schedule F consisting of:

- i. Various standard clauses with corrections upto the date stipulated in Schedule F along with annexures thereto.
- ii. CPWD Safety Code.
- iii. Model rules for protection of health, sanitary arrangements for workers employed by CPWD or its contractors.
- iv. CPWD Contractors Labour regulations
- v. List of Acts and Omissions for which fines can be imposed.

1.30. **Bid document consists of :**

- 1.30.1. **Volume – I (Notice Inviting Tenders (NIT), PQ Criteria& Instructions to Bidders (ITB))**
- 1.30.2. **Volume – II (General Conditions of Contract)**
- 1.30.3. **Volume – III (Specific Conditions of Contract)**
- 1.30.4. **Volume – IV (Technical Specifications)**

1.30.5. **Volume – V (Bill of Quantities)**

1.30.6. **Volume – VI (Tender Drawings)**

**All amendments(s)/ corrigendum, if any.**

- 1.31. **In respect of this project, the Independent External Monitors (IEMs) would monitor and oversee implementation and effectiveness of the Integrity Pact Program.**
- 1.32. *HSCC (I) Ltd* reserves the right to accept or reject any or all the tenders without assigning any reason, No Bidder shall have any cause of action or claim against the HSCC (I) Ltd (*Executing Agency*) for rejection of his tender.

Chief General Manager,  
HSCC (India) Limited  
As Executing Agency on behalf  
Ministry of Health & Family Welfare,  
Govt. of India

## **SECTION-II**

### **INSTRUCTIONS TO BIDDERS (ITB)**

#### **2 Introduction:**

The Project **Pradhan Mantri Swasthya Suraksha Yojna (PMSSY)** has been launched by the Government of India with the objective of providing tertiary health care and quality medical education to the underserved areas of the country.

These Institutions will provide leadership in the area of medical and nursing education, biomedical research and in the application of sophisticated medical technology to patient care and at affordable cost.

#### **2.1 Eligibility Criteria : As per Notice inviting Bids**

#### **2.2 Disqualification.** *Even if a Contractor meets the eligibility criteria as, HSCC (Executing Agency) may, at their discretion and at any stage during the selection process or execution of the Project, order disqualification of the contractor if the Contractor has:*

- 2.2.1 Made misleading or false representations in the forms, statements and attachments submitted; or
- 2.2.2 The Contractor has been blacklisted by any government agency even after bids have been opened; or
- 2.2.3 Record of poor performance such as abandoning work, not properly completing the contract, or financial failures/weaknesses etc.

#### **2.3 BID Documents :**

##### **2.3.1 Contents of BID Documents**

BID Document shall consist of the documents listed in this document along with any schedules, addendum or corrigendum etc. issued by HSCC for the purpose.

##### **2.3.2 Pre-Bid Conference**

The purpose of the meeting will be to clarify issues and to answer questions on any matter that may arise at this stage. HSCC (I) Ltd shall conduct pre-Bid meeting(s) at the time and venue mentioned in Notice Inviting Bid to answer any queries / provide clarifications that the Bidders may have in connection with the Project and to give them relevant information regarding the same.

##### **2.3.3 Clarifications**

A prospective Contractor requiring any clarification with regards to the BID document may notify Chief General Manager, HSCC (India) Limited, E-6(A), Sector 1, Noida – 201 301 in writing or by tele-fax at the mailing address indicated in Notice Inviting Bid. Chief General Manager, HSCC (India) Limited will respond any request for clarification which is received within seven days of

the first date of issue of the Tenders. Written Copies of the Chief General Manager, HSCC (India) Limited's response (including an explanation on the query but without identifying the source of the inquiry) shall be uploaded on the e-tender portal <http://www.tenderwizard.com/HSCC>. Only written communication/ clarification can be considered as valid

#### 2.3.4 Amendment to BID Document

- i. At any time prior to the deadline for the submission of Bids, HSCC may, for any reason, whether at its own initiative or in response to a clarification or query raised by prospective Bidders, modify the BID document by an amendment.
- ii. The said amendment s in the form of the addendum/corrigendum will be made available on HSCC e-tender portal not later than 3 days prior to the original or extended deadline for the submission of the bids. The uploading of the said amendments shall be binding of the bidders. The Bidders are strongly advised to regularly visit HSCC e- tender portal <http://www.tenderwizard.com/HSCC> to ensure that they are aware of the amendments. The addendum (s) issued will form part of the BID documents.
- iii. In order to afford prospective Bidders reasonable time for preparing their Bids after taking into account such amendments, the HSCC may, at its discretion, extend the deadline for the submission of Bids.
- iv. The above information will only be placed on HSCC e-tender portal and it will be the responsibility of the bidders to read.

#### 2.3.5 Preparation of Bid:

##### a) Bidder's responsibility:

- i. The Bidder is solely responsible for the details of his Bid and the preparation of Bids.
- ii. The Bidder is expected to examine carefully all the contents of BID document as mentioned in Notice Inviting Bids including instructions, conditions, forms, terms, etc. and take them fully into account before submitting his offer. Bids, which do not satisfy all the requirements, as detailed in these documents, are liable to be rejected as being unresponsive.
- iii. The Bidder shall be deemed to have inspected the Site and its surroundings and taken into account all relevant factors pertaining to the Site, while preparing and submitting the Bid.

##### b) Project Inspection and Site Visit

Any Site information given in this Bid Document is for guidance only. The Bidder is advised to visit and examine the Site of works and its surroundings

at his/their cost and obtain at his/their own responsibility, any information that may consider necessary for preparing the Bid and entering into a Contract with HSCC (I) Ltd. (*Executing Agency*), including availability of electricity, water and drainage, where applicable.

HSCC shall not be liable for such costs, regardless the outcome of the selection process.

c) Documents Comprising the Bid

Bidder shall submit their Bids online only in two packages namely the Technical Package and the Financial Package. The contents of the technical and financial package are as mentioned hereinafter i.e. Clause 2.3.6 & 2.3.7.

d) Alternative Proposal by bidders:

Bidders shall submit offers that comply with the requirement of the Tender, including basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

**2.3.6 Contents of Technical Package:**

The technical package, clearly labeled as “**TECHNICAL PACKAGE**”, has to be submitted in two parts.

**(A) Technical Package Part –I ; Shall be submitted in ORIGINAL in envelope no. 1 with a copy uploaded online and shall comprise the following :**

- I. Original Non-refundable Demand Draft of Rs. 25000/- as Tender Fee
- II. Bid Security, in original,
  - a. The Bidder shall enclose EMD with their Bid for an amount, as mentioned in Notice Inviting Bids.
  - b. The EMD will be in the form of demand draft of a scheduled bank issued in favour of “**HSCC (I) Ltd**” payable at New Delhi/Noida or fixed deposit receipt or Banker’s cheque or Bank Guarantee in favour of “**HSCC (I) Ltd** ” as per Form B, having validity for six months or more from the last date of receipt of tenders. The Bank guarantees should be irrevocable and operative for a period of six months or more from the last date of receipt of tenders or any extension thereof.
  - c. Bids not accompanied by EMD & tender fee, shall be treated as non-responsive, and will be summarily rejected by HSCC (I) Ltd.

- d. The Bid securities of unsuccessful Bidders shall be discharged/ returned by HSCC in not later than 30 days after the expiration of the period of Bid Validity.
  - e. The Bid Security shall be forfeited if a bidder withdraws his bid during the period of bid validity or in the case of the successful bidder, if he fails to furnish the necessary performance security or enter into the Contract within the specified time limit.
- III. Form A- Form of bid and Appendix Form A -Appendix, duly signed and filled.
- IV. Original affidavit (as per format at Form K)
- (B). **Technical Package Part –II shall be submitted online only duly digitally signed &** stamped by authorized signatory and comprise the following:
- a) Indemnity/ undertaking as per requirements of clause 1.28 (Form M)
  - b) The enclosed documents shall be uploaded and mentioned as Annexure I
    1. Power of attorney (Form E) in favour of the person signing the Bid
    2. Affidavit/ Undertaking for engaging specialized agencies - (Form H)
    3. Form “T-1” (Financial Information) – Annual Financial Statement for the last five year
    4. Form “T-1-B”(Solvency Certificate from a Scheduled Bank )
    5. Form “T-2” (List of all works of similar nature successfully completed during the last seven years)
    6. Form “T-4” (Performance Report of Works)
    7. Form “T-5” (Structure and Organization)
    8. Copies of GST Registration or undertaking in this regard as per Clause 1.27.
    9. Certificate of Registration for GST and acknowledgement of up-to-date file return.
    10. Integrity Pact and Agreement duly signed by the person authorized to sign the bid on behalf of the bidder. (as per Performa given in GCC, Vol-II)

### 2.3.7 Contents of Financial Package

The financial package (**VOLUME V - BILL OF QUANTITY/ PRICE BID**) should be submitted **ONLINE** only. These percentage rate/prices should include all costs associated with the Project including any out of pocket / mobilization expenses, taxes, charges, levies, cess, GST, VAT, Service Tax etc., excluding PF



& ESI as per GCC, applicable till the date of submission of bids or any extension thereof. In case Government levies/modifies any tax subsequently the same will be adjusted plus/minus as the case may be. The Bidder must ensure to fill up percentage against summary of each components. If any cell is left blank then value of that cell shall be treated as “0” (ZERO).

### 2.3.8 Language of Bid

The Bid and all related correspondence and documents relating to the Project shall be in English language.

### 2.3.9 Currency of Bid

Bid prices shall be quoted in Indian Rupees only. The amount mentioned elsewhere in the bid document will also deemed to be in Indian Rupees unless otherwise mentioned.

### 2.3.10 Extension of Bid Validity

Prior to the expiry of the original Bid Validity Period, HSCC may, at its discretion, request Bidders to extend the Bid Validity Period for a specified additional period and also correspondingly extend the period of validity of Bid Security submitted in the form a Bank Guarantee.

### 2.3.11 Format and Signing of Bid

- a. Bid documents (technical package/ bid Part II and financial package/ bid) shall be digital signed by a person duly authorized to sign the Bid documents. The Bidder shall also submit a power of attorney authorizing the person signing the documents.
- b. Entries to be filled in by the Bidder shall be typed or written in indelible ink.
- c. The complete Bid shall be without alterations, overwriting, interlineations or erasures except those to accord with instructions issued by HSCC, or as necessary to correct errors made by the Bidder. All amendments/corrections shall be initialed by the person or persons signing the Bid.
- d. All witnesses and sureties shall be persons of status and probity and their full names, occupations and addresses shall be written below their signatures.

### 2.3.12 Sealing and Marking of Bids

- a. The Bid shall be submitted along with documents and mode of submission mentioned at Clause 2.3.6 and Clause 2.3.7 of Volume I and also mentioned in the Checklist at Annexure - I of this volume I.

Please note that the percentage should not be indicated in any of the documents enclosed in Technical package part I and Technical Package

part II. Non-compliance shall entail rejection of the Bid.

- b. In the case of percentage Rate Tenders, only percentage quoted shall be considered. Any tender containing rates below/above quoted is liable to be rejected. Rates quoted by the contractor in percentage shall be accurately filled. In e-tendering, the intending bidder can quote his percentage in figures only. The percentage rate in words, amount of each item and total is generated automatically. Therefore, the rate quoted by the bidder in percentage shall be taken as correct. In event no percentage has been quoted for any item (s), it will be presumed that the contractor has included the cost of this/these items(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly.

However, if a tenderer quotes nil percent against each item in item tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.

Please note that the price should not be indicated in any of the documents enclosed in Envelope no. 1 & 2. Non-compliance shall entail rejection of the Bid.

### 2.3.13 Submission of Bids

- i. Bids should be submitted online to:

**Chief General Manager  
HSCC (India) Limited,  
E-6(A), Sector 1,  
Noida – 201 301**

- ii. The last date for submission of completed Bids is given in Notice Inviting Bids. The HSCC (I) Ltd may, at their discretion, extend this date, in which case all rights and obligations of the HSCC (I) Ltd and the Bidder shall thereafter be subjected to the new deadline as extended. If such nominated date for submission of Bid is subsequently declared as a public holiday, the next official working day shall be deemed as the date for submission of Bid.
- iii. Required documents which are required to be submitted in original as per mode defined in Checklist at Annexure I of volume I, shall be submitted by hand or through registered post or courier service at the address mentioned above. HSCC shall not take any cognizance and shall not be responsible for delay/loss in transit or non-submission of said documents in time.
- iv. Required documents sent telegraphically or through other means of transmission (Tele-fax, E-mail etc.), which cannot be delivered in a sealed envelope, shall be treated as defective, invalid and shall stand rejected.
- v. Modifications/ Substitution/ Withdrawal of Bids
  - (a) No modification or substitution of the submitted Bid shall be allowed after last

date of submission of bids.

- (b) A Bidder may withdraw its submitted Bid, provided that written notice of the withdrawal is received by Chief General Manager, HSCC (I) Ltd. E-6A, Sector-1, Noida-201301, before the last date for submission of Bids.
- (c) Only a single copy of the withdrawal notice shall be prepared and each page of the notice shall be signed and stamped by the authorized signatory. The notice shall be duly marked "WITHDRAWAL". This withdrawal notice will be opened at the time of opening of bid and not earlier. The signature of GPA holder will be verified and withdrawal shall be considered only in case both are same.

vi. Bid Due Date

- a. Bids should be received at the address mentioned in this document, on or before the stipulated/extended time and date as specified in Notice Inviting Bids.
- b. HSCC may, in exceptional circumstances, and at its sole discretion, extend the Bid due date by issuing an addendum.

vii. Late Bids

Any Bid received at the address mentioned above after the deadline prescribed for submission of Bids in Notice Inviting Bids/extended date as the case may be, herein will not be considered and will be returned unopened to the Bidder.

**2.3.14 Power of Attorney:**

Bidders shall submit, along with Technical Package - Part II, a power of attorney, on a stamp paper of appropriate value, in favour of the person signing the Bid documents authorizing him to sign the Bid documents, make corrections/ modifications thereto and interacting with HSCC and act as the contact person. The format for the power of attorney shall be as per form E of Bid Document Volume-I. In case bids are signed by Managing Director/Partner/Proprietor himself, Power of Attorney is not required.

In the event of tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act 1932.

**2.3.15 Bid Opening and Evaluation:**

**Bid Opening**

- i. The Bids will be opened in the presence of Bidders or their authorized representatives who may choose to attend on date & time as mentioned in Notice Inviting Bids. If such nominated date for opening of Bid is subsequently declared as a public holiday, the next official working day shall

- be deemed as the date of opening of the Bid.
- ii. Bids for which an acceptable notice of withdrawal has been submitted shall not be opened.
  - iii. Bids which have not complied with one or more of the foregoing instructions may not be considered.
  - iv. On opening of the Bid, it will be checked if they contain Technical & Financial Bids and EMD/ Bid Security as detailed above.
  - v. Technical Package Part I of the Bids will only be opened. They will be checked for completeness and confirmation of submission of the requisite Bid Security. If the documents do not meet the requirements of the Tender, a note will be recorded.
  - vi. The Bidders name, the presence or absence of the requisite Bid Security and any other details as HSCC or their authorized representative, may consider appropriate will be announced at the time of Bid opening.
  - vii. Technical Package Part-II of only the bidders whose Bid Securities and cost of bid document are found in order will be opened
  - viii. Technical evaluation shall be as per section IV, Evaluation Process.
  - ix. Financial Package of all bidders whose bids are found responsive after Technical evaluation will be opened at a later date.

#### 2.3.16 Determination of Responsiveness

- i. Prior to the detailed evaluation of Bids, HSCC will determine whether each Bid is responsive to the requirements of the tender.
- ii. For the purpose of this clause, a responsive Bid is one which:
  - a. have digital signature.
  - b. is accompanied by the power(s) of attorney if required
  - c. contains all the information as requested in the Bid Document
  - d. contains information in formats same/similar as those specified in this Bid Document
  - e. mentions the validity period of the offer
  - f. is accompanied by the Bid Security/ EMD,
  - g. conforms to all the terms, conditions and specifications of Tender without material deviation or reservation. "Deviation" may include exceptions and exclusions. A material deviation or reservation is one which affects, in any substantial way, the scope, quality, performance or administration of the works to be undertaken by the Bidder under the Contract, or which limits in any substantial way, HSCC's rights or the Bidder's obligations under the Contract as provided for in Bid and/or is of an essential

condition, the rectification of which would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids at reasonable price.

- iii. If a Bid is not substantially responsive to the requirements of Bid, it will be rejected by HSCC. The decision of HSCC in this regard shall be final and binding. The financial Packages of non-responsive Bidders shall not be opened.

#### 2.3.17 Evaluation of Bids

- i. *HSCC* would examine and evaluate responsive Bids, as per the criteria set out in this document at Section IV Evaluation Process
- ii. *HSCC* reserves the right to reject any Bid if:
  - a. At any time, a material misrepresentation is made or uncovered; **or**
  - b. The Bidder does not respond within the stipulated time to requests for supplemental information/ clarifications required for the evaluation of the Bid; **or**
  - c. It is found that the information provided is not true or incorrect or facts/ material for the evaluation have been suppressed.

#### 2.3.18 Clarification of Bids

- i. Evaluation of technical Bids submitted by Bidders shall be undertaken based on details submitted therein only. Bidder shall not be allowed to submit on their own, additional information or material subsequent to the date of submission and such material / information, if submitted, will be disregarded. It is therefore essential that all details are submitted by the Bidder comprehensively, accurately and specifically in their technical Bid, avoiding vague answers. However, Evaluation Committee, if it so desires, reserves the right to seek any clarification from the Bidders on the information provided in the technical package. The request for clarifications and the response shall be in writing, or by tele-fax. No change / addition in the information or substance of the Bid shall be sought, offered or permitted.
- ii. To assist in the examination, evaluation and comparison of the financial Bid, Evaluation Committee may ask Bidders individually for clarifications. The request for clarification and the response shall be in writing or by tele-fax. No change in the price or substance of the Bid shall be sought, offered or permitted except as required to confirm correction of arithmetical errors observed by the Evaluation Committee during the evaluation of Bids.

#### 2.3.19 Process to be Confidential

- i. Except the public opening of the Bids, information relating to the examination, clarification, evaluation and comparison of Bids and recommendations concerning the award of Contract shall not be disclosed to Bidders or other

persons not officially concerned with such process.

- ii. Any effort by a Bidder to influence HSCC's Evaluation Committee in the process of examination, clarification, evaluation and comparison of Bids and in decisions concerning award of Contract, shall result in the rejection of their Bid.

### 2.3.20 Award of Contract

- i. Award Criteria

*HSCC (I) Ltd* , will declare the Bidder ranked L1 as Successful Bidder and proceed to issue Letter of Award (LOA) as per the procedure mentioned in the Bid Document and terms and conditions set out in this Bid document.

- ii. Notification of Award

- a. Prior to the expiry of the period of Bid Validity, HSCC (I) Ltd will issue the Letter of Award to the Successful Bidder, notifying him of being declared successful and the intent to sign the Contract Agreement with him. This letter (hereinafter and in the Conditions of Contract called 'the Letter of Award') shall mention the sum which HSCC, will pay to the Contractor in consideration of the completion and guarantee of the work to be performed by them, as prescribed therein (hereinafter and in the conditions of Contract called 'the Contract Price'). No correspondence will be entertained by HSCC/MOH&FW from the unsuccessful Bidders.
- b. The Letter of Award shall constitute a part of the Contract.
- c. Upon submission of Performance Guarantee by the Successful Bidder, HSCC will promptly notify the other Bidders and discharge / return their Bid securities.

- iii. Signing of Agreement

- a. *HSCC (India) Limited* shall prepare the Contract Agreement in the Proforma (Form D) included in this document, duly incorporating all the terms of agreement between the two parties. Within FIFTEEN days from the date of issue of the Letter of Award the Successful Bidder will be required to execute the Contract Agreement.
- b. Prior to the signing of the Contract Agreement, the Successful Bidder shall submit Performance Guarantee.
- c. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/registrations or proof of applying for obtaining labour licenses, registration with EPFO, ESIC and BOCW Welfare Board and Programme Chart (Time and Progress) within the period specified in schedule F.
- d. The Contract Agreement shall be duly signed by the Executing Agency and the Contractor through their authorized signatories.

- e. In case the Successful Bidder does not sign the Contract Agreement, HSCC reserves the right to cancel the selection process, forfeit any Bid Security and/or Performance Guarantee, as the case may be, submitted by the Successful Bidder and either re-Bid or proceed in any manner that it may deem fit.
- f. Contract agreement will be signed by the authorized signatories.
- g. All amendments / addendums shall be made available at HSCC e-tender portal <http://www.tenderwizard.com/HSCC>. It will be the responsibility of the bidder to see the web site regularly and update.

**SECTION-III**  
**SCOPE OF WORK**

1. Bids are now invited for following scope of works:

**Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (Andhra Pradesh).under PMSSY** including internal electrification, HVAC, PHE, fire-fighting external development etc. and their Maintenance during Defect Liability Period etc.

2. Detailed engineering drawings including architectural drawings, structural drawings, drawings for all services, landscaping drawings, electrical services drawings, internal telecommunication and networking, fire detection and protection systems drawings (where required) & drawings, drawings for water supply & PHE etc will be supplied by HSCC.
3. The surveyed site plan and Master plan along with the report of geotechnical investigation are available and will be made available to finally selected Contractor.
4. The activities to be carried out for the completion of the Project shall include the following and any additional activities incidental to these:
- i. Buildings as specified.
  - ii. Internal and external services as per drawings
  - iii. Getting all approvals / permissions / planning permits of the statutory / local / governmental agencies as required incidental to construction/ completion.
  - iv. Submission of the completion (i.e. 'as-built') drawings and other related documents, both a hard copy and the soft copy in Auto CAD or any other IT application used for the purpose.
  - v. Preparation of specifications and vender list (in case not already provided) for all equipment wherever necessary and called upon to do so and getting these approved from client.
  - vi. Obtaining occupancy certificate and related NOC's from statutory/ local/governmental agencies. Statutory payment on this account will be reimbursed by the client at actuals on production of payment receipts

**5. Approvals Required**

The Contractor shall obtain all necessary approvals except pre-construction from Municipal and other local bodies including Municipal bodies, Water supply agencies concerned, Electric Supply and inspectorate. Agencies concerned, Police and Security Agencies, Chief Controller of Explosives, Fire Department, Civil Aviation Department, concerned in accordance to prevailing rules, Building Bye-Laws, tree



cutting etc., as the case may be with related to/ required for Construction/Completion. All expenditure on this account will be borne by the contractor.

The approvals shall include the following in addition to any other approval which may be required for the project.

- Construction Permit if required
- NOC from Chief Fire Officer
- NOC from Lift Inspector where lifts are provided
- Occupancy certificate

*HSCC* may, at the written request of the Contractor, assist him in obtaining the approvals from relevant authorities. However any such request by the Contractor shall not bind *HSCC* in any manner.

## SECTION IV

### EVALUATION PROCESS

#### **4.1 Evaluation Process:**

The Bids will be evaluated in the following stages:

- i. Stage 1- Technical Evaluation
- ii. Stage 2- Financial Evaluation.

#### **4.2 Stage 1-Technical Evaluation**

- i. The technical Bids shall be evaluated as per criteria mentioned in Clause 1.4 in respect of experience of similar class of works completed, and financial turnover etc. will first be scrutinized and bidder's eligibility for the work be determined.
- ii. The bidders qualifying the initial criteria as set out in Clause 1.4 will be evaluated for following criteria by scoring method on the basis of details furnished by them.

|     |  |                  |
|-----|--|------------------|
| (a) | Financial strength (Form 'T-1' & 'T-1 B')  | Maximum 20 marks |
| (b) | Experience in eligible similar nature of work during last seven years (Form 'T-2') | Maximum 20 marks |
| (c) | Performance on works (Form 'T-4') – Time over run                                  | Maximum 20 marks |
| (d) | Performance on works (Form 'T-4') – Quality  | Maximum 40 marks |
|     | <b>Total</b>   | <b>100 marks</b> |

To become eligible for short listing, the bidder must secure at least 50% marks in each attribute {(a), (b), (c) & (d) above) and minimum 60% marks in aggregate.

Note : The average value of performance of works for time overrun and quality shall be taken on the basis of performance report of the eligible similar works.

The financial Bid of only those Bidders who are technically qualified shall be opened.

- iii. The financial Bids of Bidders whose technical Bids are found unacceptable shall be not be opened
- iv. HSCC shall notify all the technically qualified Bidders of their technical qualification indicating the date, time and venue for opening of financial Bids.

#### **4.3 Stage II-Financial Evaluation**

- i. Evaluation Committee shall open the financial Bid of the technically qualified Bidders in the presence of the Bidders/their authorized representative, who choose to attend, at the scheduled date and time.
- ii. On opening the financial Bids, the Evaluation Committee shall read out the financial Bid to all the Bidders and note the same.

- iii. The Evaluation Committee shall correct arithmetic errors, if any and sign the same. If any discrepancy is found between the amount in percentage/figures and the amount in words, the amount in words shall prevail.
- iv. If a tender quotes nil against each item in percentage rate tender or does not quote any percentage above/below on the total amount of the tender or any section/sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tender.
- v. All the financial Bids shall then be ranked according to the financial Bid in increasing order with the Bidder quoting the least amount ranked L1, Bidder quoting next higher figure as L2 and so on.
- vi. L1 will be declared as Successful Bidder and his offer will be processed further.
- vii. (a) The financial bid of all eligible bidders as decided by Client shall be opened and the decision of Client will be final and binding.  
(b) The date and time of opening of financial bids shall be decided by Department which will be intimated at an appropriate time

#### **4.4 Letter of Award:**

The Successful Bidder would be notified in writing by HSCC by issuing the Letter of Award (LOA) in favour of the Bidder.

**Annexure -1 Checklist****CHECK LIST OF DOCUMENTS TO BE SUBMITTED WITH THE BID****TECHNICAL PACKAGE - Part I**

| S.No | Name of Document   | Mode of submission  | Page No. |
|------|--|---|----------|
| 1.   | Non -refundable Demand Draft of Rs.25,000/- (Rs. Twenty Five thousand) only as cost of bid, in favour of “ <b>HSCC (India) Limited</b> ” payable at Noida /Delhi | <b>In Original in Envelop no. 1<br/>&amp;<br/>Copy Online</b> |          |
| 2.   | Bid Security (Form B) in separate sealed envelope  |   |          |
| 3.   | Form of bid and Appendix (Form A) for the bid  |   |          |
| 4.   | Affidavit by Bidder (Form K) on a duly notarized non judicial Rs.100/- stamp paper   |   |          |

**TECHNICAL PACKAGE - Part II**

| S.No | Name of Document   | Mode of submission | Page No. |
|------|--|--------------------|----------|
| 1    | Power of attorney (Form E) in favour of the person signing the Bid   | <b>Online only</b> |          |
| 2    | Affidavit for engaging specialized agencies (Form H)   |                    |          |
| 3    | Form “ Form “T-1” (Financial Information)  |                    |          |
| 4    | Form “T-1-B”(Solvency Certificate from a Scheduled Bank )  |                    |          |
| 5    | Form “T-2” (Details of works)  |                    |          |
| 6    | Form “T-4” (Performance Report of Works)   |                    |          |
| 7    | Form “T-5” (Structure and Organization)  |                    |          |
| 8    | Copies of GST Registration or undertaking in this regard as per clause 1.27  |                    |          |
| 9    | Integrity Pact and Agreement duly signed by the authorized signatory on behalf of the bidder (as per Performa given in GCC Vol-II) |                    |          |
| 10   | Undertaking as per requirement of clause-1.28 (as per form M)  |                    |          |
| 11.  | Certificate of registration for GST and acknowledgement of up-to-date file return.   |                    |          |

**FINANCIAL PACKAGE COMPRISING OF:**

| S.No | Name of Document   | Mode of submission | Page No. |
|------|--|--------------------|----------|
| 1.   | Digitally signed bid / Price Bid (Bill of Quantities – Volume-V) | Online             |          |

Note: The bidders are required to submit all documents duly authenticated by digital signatures and online only. No hard copy of the documents is required to be submitted except

- Original non-refundable Demand Draft of Rs.25000/- (Rs. Twenty Five Thousand Only) as cost of bid, in favour of “HSCC India Limited” payable at Noida/New Delhi
- Original Bid Security as per approved Form B – Vol. I of Tender which should be submitted to the office of Chief General Manager, HSCC (India) Limited, E-6(A), Sector 1, Noida – 201 301 before the date and time fixed for opening of bid either by registered post or by hand failing which the bid will be declared non-responsive.

**Form A-Form of Bid and Appendix****FORM OF BID**

**Name of the Work:** Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (Andhra Pradesh) including internal electrification, HVAC, PHE, fire fighting, external development etc. and their Maintenance during Defect Liability Period.

To

Chief General Manager,  
HSCC (India) Limited,  
E-6(A), Sector 1,  
Noida – 201 301

**Sub : Submission of Proposal**

Having visited the Site, ascertained the Site conditions and examined the General Conditions of Contract as well as Specific Conditions of Contract, Notice Inviting Bids, Instructions to Bidders etc. and addenda for the above project, we the undersigned, are pleased to submit our technical and financial Bid along with relevant documents.

1. We acknowledge that the Appendix forms an integral part of the Bid.
2. While preparing this Bid, we have gathered our own information and conducted our own inquiry/survey to our satisfaction and we did not rely solely on the information provided in the Bid Documents. We shall not hold HSCC (I) Ltd responsible on any account in this regard.
3. We undertake, if our Bid is accepted, to commence the works within the stipulated time and to complete the whole of the works comprised in the Contract within the stipulated time calculated from the start date
4. If our Bid is accepted, we will furnish a bank guarantee as Performance Guarantee for the due performance of the Contract. The amount and form of such guarantee or bond will be in accordance with as given in the General Conditions of the Contract.
5. We are aware that in the event of delay in execution of the Project, beyond the agreed timelines due to reasons attributable to us, liquidated damages shall be recovered from us.
6. Our Bid is valid for your acceptance for a period of ONE HUNDRED AND EIGHTY DAYS from the last date of submission of the Bid as per the Bid Documents or any extension thereto.
7. We agree to the General Conditions of Contract and Specific Conditions of Contract and the terms and conditions mentioned in the Bid Documents.
8. We declare that the submission of this Bid confirms that no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item of work related to the award of this Contract. We further confirm and

declare that no agency commission or any payment, which may be construed as an agency, commission has been, or will be, paid and that the Bid price does not include any such amount. We acknowledge the right of HSCC (India) Limited, if it finds anything to the contrary, to declare our Bid to be non-compliant and if the Contract has been awarded to declare the Contract null and void.

- 9. We understand that you are not bound to accept the lowest or any Bid you may receive.
- 10. If our Bid is accepted, we understand that we are to be held solely responsible for the due performance of the Contract.
- 11. We enclose;
  - a. All documents as per the checklist
  - b. Bank guarantee for Rs \_\_\_\_\_ (Rupees \_\_\_\_\_ only) issued by \_\_\_\_\_ (name of the bank) valid until \_\_\_\_\_ towards EMD.

- Note :
- i. The Appendix forms part of the Bid
  - ii. Bidders are required to fill up all the blank spaces in this form of Bid and Appendix.

Dated this.....day of.....**2018**

Signature .....

Name..... in the capacity of .....

duly authorized to sign Bids for and on behalf of.....

Address .....

.....

.....

Witness - Signature .....

Name .....

Address .....

.....

.....

**Form A Appendix**APPENDIX TO THE FORM OF BID

|     |  |  |
|-----|--|--|
| i.  | (a) Amount of Performance Guarantee to be deposited by financially successful bidder           | As per Clause 1 of GCC   |
|     | (b) Amount of Security Deposit   | As per Clause 1 A of GCC   |
| ii  | Date for commencement of work  | 15 days from letter of award or 15 days after handing over of site whichever is later.   |
| iii | Time for completion  | 22 Calendar months<br>Phase I - 18 Calendar Months for all buildings of the Academic Campus i.e., Medical College, Nursing College, Admin Block, Library including completion of all services (within the scope of this tender) required for making these buildings operational<br>Phase II - 22 Calendar Months for all other buildings and works |
| iv. | Amount of compensation in case of extension of completion date due to delays by the Contractor | As per Clause 2 of GCC   |
| v.  | Defects Liability Period from the date of issue of "Taking-over certificate"                   | 12 months  |
| vi. | (a) Period of validity of Performance Guarantee  | As per of GCC  |
|     | (b) Period of validity of Security Deposit   | As per of GCC  |

Signature

(Authorized Signatory)

Date .....

Name .....

Place .....

Address .....

**Form B****FORMAT FOR EMD/ BID SECURITY BANK GUARANTEE**

(To cover payment of Bid Security and Conditions of Contract)

(On a stamp paper of appropriate value from any Nationalised Bank or Scheduled Bank)

To

Chief General Manager,  
HSCC (India) Limited,  
E-6(A), Sector 1,  
Noida – 201 301

Dear Sir,

In consideration of your agreeing to accept Bank Guarantee for Rs. .... (Rupees ..... ) in lieu of payment from M/s ..... having its /their registered office at .....(hereinafter called the Bidder) towards Bid Security in respect of your Tender no. .... calling for Tender for .....at ..... and for due fulfilment of the terms and conditions of the said Tender, we hereby undertake and agree to indemnify and keep you indemnified to the extent of Rs ..... (Rupees .....).

In the event of any loss or damages, costs, charges or expenses caused to or suffered by you by reason of any breach or non-observance on the part of the Bidder of any terms and conditions of the said Tender, we shall on demand and without cavil or argument, and without reference to the Bidder, irrevocably and unconditionally pay you in full satisfaction of your demand the amounts claimed by you, provided that our liability under this guarantee shall not at any time exceed Rs .....(Rupees .....).

This guarantee herein contained shall remain in full force and till you finalise the Tender and select the Tender as per your choice and it shall in the event of the said Bidder being selected and entrusted with the said work, continue to be enforceable till the said Bidder executes the Agreement with you and commences the work as stipulated under the terms and conditions of the said Tender have been fully and properly carried out by the said Bidder and accordingly discharges the guarantee.

We also agree that your decision as to whether the Bidder has committed any breach or non-observance of the terms and conditions of the said Tender shall be final and binding on us.

We undertake to pay the Executing Agency any money so demanded by the Executing Agency notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceedings pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such a payment.



This guarantee shall continue to be in full force and effect for a period of six months from the date of submission of Bid. Notwithstanding the above limitations, we shall honour and discharge the claims preferred by you within thirty days of expiry of this guarantee.

We shall not revoke this guarantee during its currency except with your previous consent in writing. This guarantee shall not be affected by any change in Constitution of our bank or of the Bidder firm. Your neglect or forbearance in the enforcement of the payment of any money, the payment whereof is intended to be hereby secured or the giving of time for the payment hereto shall in no way relieve us our liability under this guarantee.

Dated this ..... day of .....

Yours faithfully,

For and on behalf of

The.....Bank.

Signature of authorized bank official

Name: .....

Designation: .....

Stamp/Seal of the Bank: .....

**Form-C****FORM OF PERFORMANCE GUARANTEE BANK GUARANTEE**

(On a stamp paper of appropriate value from any Nationalised Bank or Scheduled Bank)

To,

Chief General Manager,  
HSCC (India) Limited,  
E-6(A), Sector 1,  
Noida - 201 301

Dear Sir,

In consideration of the HSCC (I) Ltd as executing agency on behalf of Ministry of Health & Family Welfare, Govt. of India, New Delhi, having offered to except the terms and conditions of the proposed agreement between.....(Executing Agency, which expression shall include his successor and assignees)& ..... M/S \_\_\_\_\_ (hereinafter referred to as "the said Contractor (s)", which expression shall include his successor and assignees) for the work of \_\_\_\_\_ **under PMSSY** Contract No \_\_\_\_\_ in terms inter alia, of the \_\_\_\_\_ Letter No. \_\_\_\_\_ dated \_\_\_\_\_ and the General Conditions of Contract and upon the condition of the Contractor's furnishing Security for the performance of the Contractor's obligations and discharge of the Contractor's liability under and in connection with the said Contract upto a sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) amounting to \_\_\_\_\_ percent of the total Contract value.

1. We, \_\_\_\_\_ (hereinafter called 'The Bank' which expression shall include its successors and assignees) hereby jointly and severally undertake to guarantee the payment to the Employer in rupees forthwith on demand in writing and without protest or demur or any and all moneys payable by the Contractor to the Employer in respect of or in connection with the said Contract inclusive of all the Employer's losses and damages and costs, (inclusive between attorney and client) charges and expenses and other moneys payable in respect of the above as specified in any notice of demand made by the Employer to the Bank with reference to this guarantee upto an aggregate limit of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only).
2. We \_\_\_\_\_ Bank Ltd. further agree that the Employer shall be sole judge of and as to whether the said Contractor has committed any breach or breaches of any of the terms and conditions of the said Contract and the extent of loss, damage, cost, charges and expenses caused to or suffered by or that may be caused to or suffered by the Employer on account thereof and the decision of the Employer that the said Contractor has committed such breach or breaches and as to the amount or amounts of loss, damage, costs, charges and expenses caused to or suffered by the Employer from time to time shall be final and binding on us.

3. The Employer shall be at liberty without reference to the Bank and without affecting the full liability of the Bank hereunder to take any other Security in respect of the Contractor's obligations and liabilities hereunder or to vary the Contract or the work to be done there under vis-a-vis the Contractor or to grant time or indulgence to the Contractor or to reduce or to increase or otherwise vary the prices of the total Contract value or to release or to forbear from enforcement of all or any of the Security and/or any other Security(ies) now or hereafter held by The Employer and no such dealing(s) reduction(s) increase(s) or other indulgence(s) or arrangements with the Contractor or release or forbearance whatsoever shall absolve the bank of the full liability to the Employer hereunder or prejudice the rights of the Employer against the bank.
4. This guarantee shall not be determined or affected by the liquidation or winding up, dissolution, or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all monies payable to the Employer in terms thereof.
5. The bank hereby waives all rights at any time inconsistent with the terms of this guarantee and the obligations of the Bank in terms hereof shall not be anywise affected or suspended by reason of any dispute or disputes having been raised by the Contractor stopping or preventing or purporting to stop or prevent any payment by the Bank to the Employer in terms hereof.
2. The amount stated in any notice of demand addressed by the Employer to the Bank as liable to be paid to the Employer by the Contractor or as suffered or incurred by the Employer on account of any losses or damages or costs, charges and/or expenses shall be conclusive evidence of the amount so liable to be paid to the Employer or suffered or incurred by the Employer as the case may be and shall be payable by the Bank to The Employer in terms hereof.
3. This guarantee shall be a continuing guarantee and shall remain valid and irrevocable for all claims of the Employer and liabilities of the Contractor arising upto and until midnight of \_\_\_\_\_.
4. This guarantee is valid till \_\_\_\_\_(date to be mentioned) (Sixty days beyond the stipulated date of completion or the extended period, thereof)
5. This guarantee shall be in addition to any other guarantee or Security whatsoever that the Employer may now or at any time anywise may have in relation to the Contractor's obligations/or liabilities under and/or in connection with the said Contract, and the Employer shall have full authority to have recourse to or enforce this Security in preference to any other guarantee or Security which the Employer may have or obtain and no forbearance on the part of the Employer in enforcing or requiring enforcement of any other Security shall have the effect of releasing the Bank from its full liability hereunder.
10. It shall not be necessary for the Employer to proceed against the said Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank notwithstanding that any Security which The Employer may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the said bank hereunder be outstanding or unrealised.

11. We, the said Bank undertake not to revoke this guarantee during its currency except with the consent of the Employer in writing and agree that any change in the constitution of the said Contractor or the said bank shall not discharge our liability hereunder.
12. We\_\_\_\_\_ the said Bank further that we shall pay forthwith the amount stated in the notice of demand notwithstanding any dispute/difference pending between the parties before the arbitrator and/or that any dispute is being referred to arbitration.
13. Notwithstanding anything contained herein above, our liability under this guarantee shall be restricted to Rs.\_\_\_\_\_ (Rupees\_\_\_\_\_ ) and this guarantee shall remain in force till\_\_\_\_\_ and unless a claim is made on us within 3 months from that date, that is before \_\_\_\_\_ all the claims under this guarantee shall be forfeited and we shall be relieved of and discharged from our liabilities there under.

Dated\_\_\_\_\_ day of \_\_\_\_\_ 2018

For and on behalf of Bank.

Issued under seal :

**Form D****FORM OF AGREEMENT**

This agreement is made at **New Delhi** on the \_\_\_\_ day of \_\_\_\_\_ **2018** between .....(*The designated authority of the Executing Agency*) as executing agency on behalf of Ministry of Health and Family Welfare (MoH&FW), Government of India (hereinafter called “.....(*Executing Agency*)” which expression shall, unless repugnant to the context or meaning thereof be deemed to mean and include its successors, legal representatives and assigns) of the **First Part.**

**Second Part**

M/s \_\_\_\_\_ a Company incorporated under the Companies Act 1956 having Head Office at \_\_\_\_\_, (hereinafter called the “Contractor” which expression unless repugnant to the context shall mean and include its successors-in-interest assigns etc.) of the **Second Part.**

Whereas .....(*Executing Agency*) is desirous that certain works should be executed, for **Construction of \_\_\_\_\_ under PMSSY** hereinafter called the “The Project” and has accepted a Tender submitted by the contractor for the execution and completion of such works as well as guarantee of such works and the remedying of defects therein.

NOW THIS AGREEMENT WITNESSTH as follows:

1. In this agreement words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and constructed as part of this agreement Viz.

**Volume - 1 (NIT & Evaluation Criteria)**

- Notice Inviting Bids
- Scope of work
- Evaluation Process

**Volume- II (GCC)**

- General Conditions of Contract

**Volume - III (SCC)**

- Specific Condition of Contract

**Volume - IV Technical Specifications****Volume - V (Financial bid and Bill of Quantities)****Volume - VI (Tender Drawings)**

**All the correspondence till award of contract i.e. addendum, LOA etc.**

**Technical and Financial bids submitted by bidder.**

3. In consideration of the payment to be made by HSCC (I) Ltd to the Contractor as hereinafter mentioned, the Contractor hereby covenants with HSCC (I) Ltd to

executed and complete the Project by ----- and remedy and defects therein in conformity in all respects with the provisions of the Contract.

4. *HSCC (I) Ltd* hereby covenants to pay the Contractor in consideration of the execution and completion of the Project and the remedying of defects therein, the total Contract Price of Rs. -----

----- only) being the sum stated in the letter of Award (LOA) subject to such additions thereto or deductions there from as may be made under the provisions of the Contract at the times and in the manner prescribed by the Contract.

#### 5. OBLIGATION OF THE CONTRACTOR

The Contractor shall ensure full compliance with tax laws of India with regard to this Contract and shall be solely responsible for the same.

IN WITNESS OF WEREOF the parties hereto have caused their respective common seals to be hereunto affixed / (or have hereunto set their respective hands and seals) the day and year first above written.

|   |   |
|---|---|
| For and on behalf of the Contractor                                     | For and on behalf of the .....( <i>Executing Agency</i> ) |
| Signature of the authorized official                                    | Signature of the authorized official                      |
| Name of the Contractor<br>Stamp / Seal of the Contractor                | Name of the official<br>Stamp / Seal                      |
| SIGNED, SEALED AND DELIVERED<br>By the said                             | By the Said   |
| on behalf of the Contractor:  | on behalf of the .....( <i>Executing Agency</i> )         |
| in the presence of:<br><br>Witness _____<br>Name _____<br>Address _____ | Witness _____<br>Name _____<br>Address _____              |

**Form E****Format for Power of Attorney for authorized signatory****FORMAT FOR POWER OF ATTORNEY FOR SIGNING OF PROPOSAL**

Know all men by these presents, we ..... (Name of the Tenderer and address of their registered office) do hereby constitute, appoint and authorize Mr / Ms.....(name and residential address of Power of Attorney holder) who is presently employed with us and holding the position of ..... as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our Bid for the Project and submission of all documents and providing information / responses to \_\_\_\_ \_\_\_\_, representing us in all matters before \_\_\_\_ \_\_\_\_, and generally dealing with \_\_\_\_ \_\_\_\_ in all matters in connection with our proposal for the said Project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

**FORM - H****UNDERTAKING**

We do hereby undertake to engage a specialised agency after approval of HSCC for undertaking the execution of specialized works (\_\_\_\_\_ Name of the specialized work \_\_\_\_\_) whose minimum qualification shall be as under:

- I. For Specialized works except DG Sets, Substation, HVAC System & Lifts:
- (i) Average Annual Financial Turnover during the last three financial years, i.e., \_\_\_\_\_, should be at least 50% of the estimated price of the works
  - (ii) Experience of having successfully completed similar specialized works during last 7 years ending previous day of last date of submission of tenders should be either of the following:
    - (a) Three similar works each of value not less than 40% of the estimated cost put to tender or two similar works each of value not less than 60% of the estimated cost put to tender or one similar work of value not less than 80% of the estimated cost, put to tender, all amounts rounded off to a convenient figure.
- II. For DG Set, HVAC and Sub Station works:
- (i) Average Annual Financial Turnover during the last three financial years, i.e., \_\_\_\_\_, should be at least 50% of the estimated price of the works
  - (ii) Experience of having successfully completed similar specialized works during last 7 years ending previous day of last date of submission of tenders should be either of the following.
    - (a) Three similar works each of value not less than 40% of the estimated cost put to tender or two similar completed works each of value not less than 60% of the estimated cost put to tender with capacity of individual DG Set/Chiller/transformer being 80% of the individual capacity (rounded off to next available higher capacity) of the equipment i.e. DG Set/ Chiller/ transformer proposed in the NIT.

OR

One similar completed work of value not less than 80% of the estimated cost put to tender with capacity of individual DG Set/Chiller/transformer being 80% of the individual capacity (rounded off to next available higher capacity) of the equipment i.e. DG Set/Chiller/transformer proposed in the NIT.

All amounts rounded off to a convenient figure.

- III. For Lifts works:

For lifts, associated agency shall be from category "A" as per the approved list by CPWD

**(Authorized Signatory of bidder)**



**Form K****AFFIDAVIT****(On a Rs 100/- non judicial stamp paper duly notarized)**

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.
2. The undersigned also hereby certifies that our firm M/s \_\_\_\_\_ have neither abandoned any contract awarded to us nor such works have been rescinded, during the last five years prior to the date of this application.
3. The undersigned also hereby confirmed M/s \_\_\_\_\_ have not been blacklisted/debarred/penalised by any government agency or public sector undertaking or judicial authority/arbitration body.
4. The undersigned hereby authorize (s) and request (s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.
5. The undersigned understands and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Client.

\_\_\_\_\_

Signed by an Authorised Officer of the Firm

**Form-M****UNDERTAKING**

We do hereby indemnify HSCC (I) Ltd *and MOHFW*, against all penal action that may be levied/effectuated by any concerned authority for default in any labour regulation/PF/ESI and other statutory requirements of the relevant Acts/Laws related to the work of the contractor and will bear the legal charges, if any, and will pay the legal charges/dues directly to the concerned authority.

**FORM 'T-1'****FINANCIAL INFORMATION**

1. **Financial Analysis**-Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last five years duly as submitted by the applicant to the Income tax Department (Copies to be attached) and duly certified by the Chartered Accountant mentioning the membership number issued by ICAI along with the full address.

- i) **Gross Annual Turnover on construction works** for last three years ending 31.03.2017

| Financial Year                                    | Annual Turn Over in Indian Rupees ( or equivalent to Indian Rupees ) from Construction works as per Audited Balance Sheet |
|---|---|
| For the Year 2014-15                              | Rs.   |
| For the Year 2015-16                              | Rs.   |
| For the Year 2016-17                              | Rs.   |
| Average Annual Turnover over the past three years | Rs.   |

- ii) **Profit / Loss** for last Five years ending 31.03.2017

| Financial Information in Rs. Equivalent | For year 2012-13 | For year 2013-14 | For year 2014-15 | For year 2015-16 | For year 2016-17 |
|---|------------------|------------------|------------------|------------------|------------------|
| 1. Total Assets                         |                  |                  |                  |                  |                  |
| 2. Current Assets                       |                  |                  |                  |                  |                  |
| 3. Total Liabilities                    |                  |                  |                  |                  |                  |
| 4. Current Liabilities                  |                  |                  |                  |                  |                  |
| 5. Profit before Tax                    |                  |                  |                  |                  |                  |
| 6. Profit after Tax                     |                  |                  |                  |                  |                  |
| 7. Net Worth                            |                  |                  |                  |                  |                  |

Financial arrangements for carrying out the proposed work.

Solvency certificate from Bankers of the bidder in the prescribed Form "T-1B".

Signature of Chartered  
Accountant with Seal

Signature of Applicant.

**FORM 'T-1 B'****FORM OF BANKERS' CERTIFICATE FROM A SCHEDULED BANK**

This is to certify that to the best of our knowledge and information that M/s./Shri ..... having marginally noted address, a customer of our bank are/is respectable and can be treated as good for any engagement upto a limit of Rs. ....(Rupees.....). This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature)

For the Bank

- NOTE (1) Bankers certificates should be on letter head of the Bank, sealed in cover addressed to tendering authority.
- (2) Incase of partnership firm, certificate should include names of all partners as recorded with the bank.

**FORM - 'T - 2'**

**DETAILS OF ALL WORKS OF SIMILAR NATURE COMPLETED**  
**DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DATE OF**  
**SUBMISSION OF TENDERS**

| Sl.No | Name of Work/ Project & location | Owner of sponsoring Organization | Cost of Work In Lakh) | Date of Commencement As per contract | Stipulated Date of completion | Actual date of completion | Litigation/ Arbitration Pending/ in Progress with details* | Name & address/ Telephone No. of officer to whom reference may be made | Remarks |
|-------|----------------------------------|----------------------------------|-----------------------|--------------------------------------|-------------------------------|---------------------------|--|--|---------|
| (1)   | (2)                              | (3)                              | (4)                   | (5)                                  | (6)                           | (7)                       | (8)  | (9)  | (10)    |
|       |                                  |                                  |                       |                                      |                               |                           |  |  |         |

\* indicate gross amount claimed and amount awarded by the Arbitrator.

Copy of work Orders and Completion Certificates of the above works should also be submitted.

Signature of Applicant

**FORM 'T - 4'****PERFORMANCE REPORT OF WORKS****REFERRED TO IN FORM "T-2"**

|     |  |                                       |
|-----|--|---------------------------------------|
| 01. | Name of work / Project & Location  |                                       |
| 02. | Agreement No.  |                                       |
| 03. | Bided Cost   |                                       |
| 04. | Executed Cost  |                                       |
| 05. | Date of Start  |                                       |
| 06. | <b>Date of completion :</b>  |                                       |
|     | i) Stipulated date of completion   |                                       |
|     | ii) Actual date of completion  |                                       |
| 07. | (a) Whether case of levy of compensation has been decided or not             | Yes/No                                |
|     | (b) If decided, Amount of compensation levied for delayed completion, if any |                                       |
| 08. | Amount of reduced rate items, if any   |                                       |
| 09. | <b>Performance Report :</b>  |                                       |
|     | a) Quality of work   | Outstanding / Very Good / Good / Poor |
|     | b) Financial soundness   | Outstanding / Very Good / Good / Poor |
|     | c) Technical Proficiency   | Outstanding / Very Good / Good / Poor |
|     | d) Resourcefulness   | Outstanding / Very Good / Good / Poor |
|     | e) General behavior  | Outstanding / Very Good / Good / Poor |

Dated : \_\_\_\_\_

Executive Engineer or Equivalent

**Form 'T - 5'****STRUCTURE & ORGANIZATION**

|     |  |  |
|-----|--|--|
| 01. | Name & Address of the applicant  |  |
| 02. | Telephone No. / Telex / Fax No.  |  |
| 03. | Legal status of the applicant (attach copies of original document defining the legal status)   |  |
|     | a) An Individual   |  |
|     | b) A proprietary firm  |  |
|     | c) A firm in partnership   |  |
|     | d) A limited company or Corporation  |  |
| 04. | Particulars of registration with various Government bodies ( <i>attach attested photocopy</i> )  |  |
|     | <u>Organization / Place of Registration :</u>  |  |
|     | 1.   |  |
|     | 2.   |  |
|     | 3.   |  |
| 05. | Names and Titles of Directors & Officers with designation to be concerned with this work   |  |
| 06. | Designation of individuals authorized to act for the organization.   |  |
| 07. | Was the applicant ever required to suspend construction for a period of more than six months continuously after you commenced the construction? If so, give the name of the project and reasons of suspension of work. |  |
| 08. | Has the applicant or any constituent partner in case of partnership firm, ever abandoned the awarded work before its completion? If so, give name of the project and reasons for abandonment.                          |  |

|     |   |  |
|-----|---|--|
| 09. | Has the applicant or any constituent partner in case of partnership firm, ever been debarred/ black-listed for Biding in any organization at any time? If so, give details. |  |
| 10. | Has the applicant, or any constituent partner in case of partnership firm, ever been convicted by a Court of Law? If so, give details.                                      |  |
| 11. | In which field of Civil Engineering construction the applicant has specialization and interest?   |  |
| 12. | Any other information considered necessary but not included above.  |  |

Signature of Applicant



## Form 'T- 8'

**CRITERIA FOR EVALUATION OF THE PERFORMANCE OF CONTRACTORS FOR PRE-ELIGIBILITY**

| ATTRIBUTES   |  | EVALUATION  |       |     |     |               |    |
|--|--|---|-------|-----|-----|---------------|----|
| (a)  | <b>Financial Strength (20 Marks)</b>   | 60% marks for minimum eligibility criteria                    |       |     |     |               |    |
|  | Average Annual Turnover (16 Marks)   | 100% marks for twice the minimum eligibility criteria or more |       |     |     |               |    |
|  | Solvency Certificate (4 Marks)   | In between (i) & (ii) - on pro rata basis                     |       |     |     |               |    |
| (b)  | <b>Experience of similar class of works (20 marks)</b>   | 60% marks for minimum eligibility criteria                    |       |     |     |               |    |
|  |  | 100% marks for twice the minimum eligibility criteria or more |       |     |     |               |    |
|  |  | In between (i) & (ii) - on pro rata basis                     |       |     |     |               |    |
| (c)  | <b>Performance on works (Time over run) (20 Marks)</b>   |   |       |     |     |               |    |
|  | Parameter  | Calculation for Point   | Score |     |     | Maximum Marks |    |
|  | If TOR=  |   | 1.0   | 2.0 | 3.0 | >3.50         | 20 |
|  | (i) Without Levy of compensation   |   | 20    | 15  | 10  | 10            |    |
|  | (ii) With Levy of compensation   |   | 20    | 5   | 0   | -5            |    |
|  | (iii) Levy of compensation not decided   |   | 20    | 10  | 0   | 0             |    |
|  | TOR = AT/ ST, where AT = Actual Time; ST = Stipulated Time in the Agreement plus (+) Justified period of extension of time   |   |       |     |     |               |    |
|  | Note: - Marks for value in between the stages indicated above is to be determined by straight line variation method.   |   |       |     |     |               |    |
| (d)  | <b>Performance of Works (Quality) (40 Marks)</b>   | Performance   | Marks |     |     |               |    |
|  |  | Outstanding   | 40    |     |     |               |    |
|  |  | Very Good   | 30    |     |     |               |    |
|  |  | Good  | 20    |     |     |               |    |
|  |  | Poor  | 0     |     |     |               |    |
|  | Bidders qualifying the initial criteria as set out in para 1.4 will be evaluated for following criteria by scoring method on the basis of details furnished by them. |   |       |     |     |               |    |
| A  | Financial strength (Form 'A' & 'B') -  | Maximum 20 marks  |       |     |     |               |    |
| B  | Experience in eligible similar nature of work during last five years (Form 'C')  | Maximum 20 marks  |       |     |     |               |    |
| C  | Performance on works (Form 'E') - Time over run  | Maximum 20 marks  |       |     |     |               |    |
| D  | Performance on works (Form 'E') - Quality  | Maximum 40 marks  |       |     |     |               |    |
|  | <b>Total -</b>   | 100 marks   |       |     |     |               |    |
| To become eligible for short listing, the bidder must secure at least 50% marks in each attribute and minimum 60% marks in aggregate.                          |  |   |       |     |     |               |    |
| Note : The average value of performance of works for time overrun and quality shall be taken on the basis of performance report of the eligible similar works. |  |   |       |     |     |               |    |

**END OF VOLUME – I  
(LAST PAGE)**

**HSCC (India) Limited  
As Executing Agency of  
MINISTRY OF HEALTH & FAMILY WELFARE,  
NEW DELHI**

**TENDER**

**FOR**

**Construction of Hospital and Academic Campus**

**at**

**All India Institute of Medical Sciences  
Mangalagiri Distt. Guntur (AP)**

**under**

**Pradhan MantriSwasthyaSurakshaYojana  
(PMSSY)**

**VOLUME – II**

**General Conditions of Contract  
(GCC)**

**JANUARY 2018**

**Executing Agency**



**HSCC (INDIA) LTD.  
E-6(A), sector-1, NOIDA(U.P) 201301 (India)**

**Phone : 0120-2542436-40**

**Fax : 0120-2542447**

**Tender No. HSCC/PMSSY/AIIMS/Guntur/H&A/2018**

**INDEX**

| <b>Sl. No.</b> | <b>Clause No.</b> | <b>Heading</b>   | <b>Page No.</b> |
|----------------|-------------------|--|-----------------|
| 01             | Section -1        | CONDITIONS OF CONTRACT   |                 |
| 02             | Section -2        | CLAUSES OF CONTRACT  |                 |
| 03             | Section-3         | SAFETY CODE  |                 |
| 04             | Section-4         | RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS |                 |
| 05             | Section-5         | CONTRACTOR'S LABOUR REGULATIONS  |                 |
| 06             | Section - 6       | FORMATS  |                 |
| 07             | Section - 7       | PROFORMA OF SCHEDULES  |                 |

**INTEGRITY PACT**

To,

.....  
.....  
.....

Sub: NIT No. .... for the work .....

Dear Sir,

It is here by declared that HSCC (India) Limited is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the HSCC ( India) Limited.

Yours faithfully

Engineer-in-Charge

**INTEGRITY PACT**

To,

Chief General Manager,  
HSCC (India) Limited,  
E-6(A), Sector 1,  
Noida – 201 301

Sub: Submission of Tender for the work of .....

Dear Sir,

I/We acknowledge that HSCC (India) Limited is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that the making of the bid shall be regarded as an unconditional and absolute acceptance of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by HSCC (India) Limited (*Executing Agency*). I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, HSCC (India) Limited shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

**To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of the HSCC (India) Limited**

### INTEGRITY AGREEMENT

This Integrity Agreement is made at ..... on this ..... day of ..... 2018

#### BETWEEN

HSCC (India) Limited, represented through, the Chief General Manager, HSCC (India) Limited as Executing Agency of Ministry of Health & Family Welfare, Government of India (Hereinafter referred as the '**Executing Agency**', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

#### AND

.....(Name and Address of the Individual/firm/Company)Through..... (Details of duly authorized signatory)..... (Hereinafter referred to as the "**Bidder/Contractor**" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

#### Preamble

WHEREAS the **Executing Agency** has floated the Tender (NIT No. ....) (Hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for .....(Name of work)hereinafter referred to as the "Contract".

AND WHEREAS the Executing Agency values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

#### **Article 1: Commitment of the Executing Agency**

- (1) The Executing Agency commits itself to take all measures necessary to prevent corruption and to observe the following principles:
  - (a) No employee of the Executing Agency, personally or through any of his/her family members, will in connection with the Tender, or the execution of the

Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

- (b) The Executing Agency will, during the Tender process, treat all Bidder(s) with equity and reason. The Executing Agency will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.
  - (c) The Executing Agency shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.
- (2) If the Executing Agency obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Executing Agency will inform the Chief Vigilance Officer of the Executing Agency and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

## **Article 2: Commitment of the Bidder(s)/Contractor(s)**

- (1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.
- (2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:
  - (a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Executing Agency's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.
  - (b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.
  - (c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Executing Agency as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.



- (d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/ representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.
- (e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.
- (3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- (4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.
- (5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

### **Article 3: Consequences of Breach**

Without prejudice to any rights that may be available to the Executing Agency under law or the Contract or its established policies and laid down procedures, the Executing Agency shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Executing Agency's absolute right:

- (1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Executing Agency after giving 14 days' notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes.

The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Executing Agency. Such exclusion may be forever or for a limited period as decided by the Executing Agency.

- (2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Executing Agency has disqualified the Bidder(s) from the Tender process prior to the award of the

Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Executing Agency apart from exercising any legal rights that may have accrued to the Executing Agency, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

- (3) Criminal Liability: If the Executing Agency obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Executing Agency has substantive suspicion in this regard, the Executing Agency will inform the same to law enforcing agencies for further investigation.

#### **Article 4: Previous Transgression**

- (1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.
- (2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.
- (3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Executing Agency may, at its own discretion, revoke the exclusion prematurely.

#### **Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors**

- (1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/sub-vendors.
- (2) The Executing Agency will enter into Pacts on identical terms as this one with all Bidders and Contractors.
- (3) The Executing Agency will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/ Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

#### **Article 6- Duration of the Pact**

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority.

**Article 7- Other Provisions**

- (1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Headquarters of the Division of the Executing Agency, who has floated the Tender.
- (2) Changes and supplements need to be made in writing. Side agreements have not been made.
- (3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.
- (4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intensions.
- (5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

**Article 8- LEGAL AND PRIOR RIGHTS**

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....

(For and on behalf of Executing Agency)

.....

(For and on behalf of Bidder/Contractor)

WITNESSES:

1. ....

(signature, name and address)

2. ....

(signature, name and address)

Place:

Dated :

## **Section -1**

### **CONDITIONS OF CONTRACT**

#### **Definitions**

1. The **Contract** means the documents forming the tender and acceptance thereof and the formal agreement executed between the competent authority as indicated in **Schedule 'F'** on behalf of the Ministry of Health & Family Welfare, Govt. of India and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.
2. In the contract the following expressions shall, unless the context otherwise requires, have the meanings, thereby respectively assigned to them:-
  - i) The expressions **works or work** shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.
  - ii) **Accepting Authority** shall mean the authority mentioned in **Schedule 'F'**.
  - iii) The **Contractor** shall mean the individual, firm or company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.
  - iv) **Department** means HSCC (India) Limited as Executing Agency of Ministry of Health & Family Welfare, Govt. of India and shall include their legal representatives, nominee, employees and Officials.
  - v) **"Executing Agency"** means HSCC (India) Limited as Executing Agency of Ministry of Health & Family Welfare, Govt. of India for the project.
  - vi) **District Specifications** means the specifications followed by the State Government in the area where the work is to be executed.
  - vii) The **Engineer-in-charge** means the Engineer Officer as mentioned in Schedule 'F' hereunder, authorized by the Department, who shall supervise and be in charge of the work.
  - viii) **Expected risk(s)** are risks due to riots (other than those on account of the contractor's employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any act of Government, damage from aircraft, acts of God, such as earthquake, lightning and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by Government of the part

of the works in respect of which a certificate of completion has been issued or a cause solely due to Government's faulty design of work.

- ix) The **Government** or **Government of India** shall mean the President of India represented by officials of MoHFW.
- x) **Market rate** shall be the rate as decided by Engineer-in-charge on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule 'F' to cover, all overheads and profits.
- Provided that no extra overheads and profits shall be payable on the part(s) of work assigned to other agency(s) by the Contractor as per terms of Contract.**
- xi) **Schedule(s)** referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the standard Schedule of Rates of the Government mentioned in Schedule 'F' hereunder, with the amendments thereto issued upto the date of receipt of the tender.
- xii) The **Site** shall mean the land/ or place on, into or through which work is to be executed under the contract or any adjacent land , path or street through which work is to be executed under the contract or any adjacent land, path or street which may be located or used for the purpose of carrying out the contract.
- xiii) **"Tendered Value"/"Contract Price"** means the value of the entire work as stipulated in the letter of award.
- xiv) **MoHFW** means Ministry of health & family welfare.
- xv) **GST** shall mean Goods and Service Tax – Central, State and Inter State.

### **Scope and performance**

3. Where the context so requires, words imparting the singular only also include the plural or vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa
4. Heading and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.
5. The contractor shall be furnished, free of cost one certified copy of the contract documents except standard specifications, Schedule of rates and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract.

### **Works to be carried out**

6. The work to be carried out under the contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The description given in the Schedule of Quantities

shall, unless otherwise stated, be held to include wastage of materials, cartage and carriage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labour necessary in and for the full entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.

### **Sufficiency of tender**

7. The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and price quoted in the Schedule of Quantities, which rates and price shall, except as otherwise provided, cover all his obligations under the contract and all matters and things necessary for the proper completion and maintenance of the works.

### **Discrepancies and Adjustment of errors**

8. The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawings and figured dimensions in preference to scale and specific conditions in preference to general conditions.
  - 8.1 In the case of discrepancy between the Schedule of Quantities, the Specifications and /or the Drawings, the following order of preference shall be observed –
    - a) Description of Schedule of Quantities
    - b) Particular specification and Specific Condition, if any.
    - c) Drawings
    - d) CPWD Specifications
    - e) Indian Standard Specifications of B.I.S.
  - 8.2 If there are varying or conflicting provisions made in any one document forming Part of the contract, Accepting Authority shall be deciding authority with regard to the intention of the document and his decision shall be final and binding on the Contractor.

Any error in description, quantity or rate in schedule of quantities or any omission therefrom shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligation under the contract.

### **Signing of Contract**

9. The successful bidder/contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of:-
  - i. The notice inviting tender, all the documents including drawings, amendments, corrigendum etc, if any, forming the tender as issued at the

time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

- ii. Standard Form as mentioned in Schedule 'F' consisting of:
  - (a) Various standard clauses with corrections upto the date stipulated in Schedule 'F' along with annexure thereto.
  - (b) C.P.W.D. Safety Code.
  - (c) Model Rules for the protection of health, sanitary arrangements for workers employed by the Client or its contractors, which are applicable for the workers employed by the Contractor for this Project.
  - (d) CPWD Contractor's Labour Regulations, to be followed by the Contractor for this Project.
  - (e) List of Acts and omissions for which fines can be imposed.
- iii. No payment for the work done will be made
  - (a) Unless contract is signed by the contractor.
  - (b) Till the copy of registration with EPFO and ESI is submitted by the contractor.

10. GST or any other tax applicable in respect of inputs procured by the Contractor for this contract shall be payable by the Contractor and Government will not entertain any claim whatsoever in respect of the same. However, component of GST at time of supply of service (as provided in CGST Act 2017) provided by the Contract shall be varied if different from that applicable on the last date of receipt of tender including extension, if any.

## CLAUSES OF CONTRACT

### CLAUSE 1

#### PERFORMANCE GUARANTEE

- (i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the tendered value in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in Schedule 'F' from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in schedule 'F' on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in the form of Cash (in case guarantee amount is less than Rs. 10,000/-) or Banker's Cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay Order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the form annexed hereto.
- (ii) The Performance Guarantee shall be initially valid up to the stipulated date of completion plus sixty days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest. The BG should be kept alive till the completion or extended period whichever is later and expenses of renewal thereof are the responsibility of the Contractor.
- (iii) The Engineer-in-Charge shall not make a claim under the performance guarantee except for amounts to which the Client is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:
  - (a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.
  - (b) Failure by the contractor to pay the Client any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge.
- (iv) In the event of the Contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Client.



**CLAUSE 1 A****RECOVERY OF SECURITY DEPOSIT**

The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 5% of the gross amount of each running and final bill till the sumdeductedwill amount to security deposit of 5% of the tendered value of the work. Such deductions will be made and held by Government by way of Security Deposit unless he/they has/have deposited the amount of Security at the rate mentioned above in cash or in the form of Government Securities or fixed deposit receipts. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the security deposit and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising therefrom, or from any sums which may be due to or may become due to the contractor by Government on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by Scheduled Banks or Government Securities (if deposited for more than 12 months) endorsed in favour of the Engineer-in-Charge, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall be collected from the running bills of the contractor at the rates mentioned above.

The security deposit as deducted above can be released against bank guarantee issued by a scheduled bank, on its accumulations to a minimum of Rs. 5 lakh subject to the condition that amount of such bank guarantee, except last one, shall not be less than Rs. 5 lakh. Provided further that the validity of bank guarantee including the one given against the earnest money shall be in conformity with provisions contained in clause 17 which shall be extended from time to time depending upon extension of contract granted under provisions of Clause 2 and Clause 5.

Note-1: Government papers tendered as security will be taken at 5% (five per cent) below its market price or at its face value, whichever is less. The market price of Government paper would be ascertained by the Engineer-in-Charge at the time of collection of interest and the amount of interest to the extent of deficiency in value of the Government paper will be withheld if necessary.

Note-2: Government Securities will include all forms of Securities mentioned in Rule No. 274 of the G.F. Rules except fidelity bond. This will be subject to the observance of the condition mentioned under the rule against each form of security.

Note-3: Note 1 & 2 above shall be applicable for both clause 1 and 1A

**CLAUSE 2****COMPENSATION FOR DELAY**

If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or justified extended date of completion as per Clause 5 (excluding any extension under Clause 5.5) as well as any extension granted under Clauses 12 and 15, he shall, without prejudice to any other right or remedy available under the law to the Government on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority specified in schedule 'F' (whose decision in writing shall be final and binding) may decide on the amount of Tendered Value of the work for every completed day/month (as determined) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified.

- (i) Compensation for delay of work @ 1 % of tendered value per month of delay to be computed on per day basis

Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed 10% of the Tendered Value of work or of the Tendered Value of the item or group of items of work for which a separate period of completion is originally given.

In case no compensation has been decided by the authority in Schedule 'F' during the progress of work, this shall be no waiver of right to levy compensation by the said authority if the work remains incomplete on final justified extended date of completion. If the Engineer in Charge decides to give further extension of time allowing performance of work beyond the justified extended date, the contractor shall be liable to pay compensation for such extended period. If any variation in amount of contract takes place during such extended period beyond justified extended date and the contractor becomes entitled to additional time under clause 12, the net period for such variation shall be accounted for while deciding the period for levy of compensation. However, during such further extended period beyond the justified extended period, if any delay occurs by events under sub clause 5.2, the contractor shall be liable to pay compensation for such delay.

Provided that compensation during the progress of work before the justified extended date of completion for delay under this clause shall be for non-achievement of sectional completion or part handing over of work on stipulated/justified extended date for such part work or if delay affects any other works/services. This is without prejudice to right of action by the Engineer in Charge under clause 3 for delay in performance and claim of compensation under that clause.

In case action under clause 2 has not been finalized and the work has been determined under clause 3, the right of action under this clause shall remain post determination of contract but levy of compensation shall be for days the progress is behind the schedule on

date of determination, as assessed by the authority in Schedule F, after due consideration of justified extension. The compensation for delay, if not decided before the determination of contract, shall be decided after of determination of contract.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case, the contractor does not achieve a particular milestone mentioned in schedule F, or the re-scheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied as above. With-holding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

## **CLAUSE 2A**

### **INCENTIVE FOR EARLY COMPLETION**

In case, the contractor completes the work ahead of stipulated date of completion or justified extended date of completion as determined under clauses 5.3, 12 & 15, a bonus @ 1% (one per cent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five per cent) of the tendered value. Provided that justified time for extra work shall be calculated on pro-rata basis as cost of extra work X stipulated period /tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in 'Schedule F'.

## **CLAUSE 3**

### **WHEN CONTRACT CAN BE DETERMINED**

Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

- (i) If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.

- (ii) If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence and continues to do so after a notice in writing of seven days from the Engineer-in-Charge.
- (iii) If the contractor fails to complete the work or section of work with individual date of completion on or before the stipulated or justified extended date, on or before such date of completion; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the opinion of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified.
- (iv) If the contractor persistently neglects to carry out his obligations under the contract and/or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.
- (v) If the contractor shall offer or give or agree to give to any person in Government service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for Government.
- (vi) If the contractor shall enter into a contract with Government in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-in-Charge.
- (vii) If the contractor shall obtain a contract with Government as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of integrity pact.
- (viii) If the contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.
- (ix) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.
- (x) If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.

- (xi) If the contractor assigns (excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Engineer -in-Charge.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the (*Executing Agency*) shall have powers:

- (a) To determine the contract as aforesaid so far as performance of work by the Contractor is concerned (of which determination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the Government
- (b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

### **CLAUSE 3A**

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is higher, either party may close the contract by giving notice to the other party stating the reasons. In such eventuality, the Performance Guarantee of the contractor shall be refunded within the following time limits:

- |  |           |
|--|-----------|
| (i) If the tendered value of work is upto Rs.45 lac                        | : 15 days |
| (ii) If the tendered value of work is more than Rs.45 lac & upto Rs.2.5Cr. | : 21 days |
| (iii) If the tendered value of work exceeds Rs.2.5 crore                   | : 30 days |

Neither party shall claim any compensation for such eventuality. This clause is not applicable for any breach of the contract by either party.

**CLAUSE 4                    CONTRACTOR LIABLE TO PAY COMPENSATION EVEN IF ACTION NOT TAKEN UNDER CLAUSE 3**

In any case in which any of the powers conferred upon the Engineer-in-Charge by Clause-3 thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the power vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work/or any part thereof, paying or allowing for the same in account at the contract rates, or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final, and binding on the contractor, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

**CLAUSE 5****TIME AND EXTENSION FOR DELAY**

The time allowed for execution of the Works as specified in the Schedule 'F' or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in schedule 'F' or from the date of handing over of the site, notified by the Engineer-in-Charge, whichever is later. However, the handing over of site by the Engineer-in Charge, in full or in part (if so provided in Contract) shall be completed within two months from issue of acceptance letter. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer in Charge and shall be absolutely at the disposal of the Government without prejudice to any other right or remedy available in law.

- 5.1 As soon as possible but within twenty one days of award of work,
- (i) the Contractor shall submit a Time and Progress Chart for each mile stone. The Engineer-in-Charge may within 30 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay

in execution of the work. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given in Schedule 'F'.

- (ii) In case of non submission of construction programme by the contractor the program approved by the Engineer-in-Charge shall be deemed to be final.
- (iii) The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligations under the contract.
- (iv) The contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by Engineer-in-Charge for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 2500/- (for works costing upto Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per week or part basis in case of delay in submission of the monthly progress report.

5.2 If the work(s) be delayed by:-

- (i) force majeure, or
- (ii) abnormally bad weather, or
- (iii) serious loss or damage by fire, or
- (iv) civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or
- (v) delay on the part of other contractors or tradesmen engaged by Engineer-in- Charge in executing work not forming part of the Contract, or
- (vi) non-availability of stores, which are the responsibility of Government to supply or
- (vii) non-availability or break down of tools and Plant to be supplied or supplied by Government or
- (viii) any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the authority as indicated in Schedule 'F' but shall nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in sub clause 5.2.

- 5.3 In case the work is hindered by any reasons, in the opinion of the contractor, by the Department or for someone for whose action the Department is responsible, the contractor may immediately give notice thereof in writing to the Engineer-in-Charge in the same manner as prescribed under sub Clause 5.2 seeking extension of time or rescheduling of milestone/s. The authority as indicated in Schedule 'F' shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work after due consideration of the same within 30 days of receipt of such request. In event of non application by the contractor for extension of time E-in-C after affording opportunity to the contractor may give, supported with a programme, a fair and reasonable extension within a reasonable period of occurrence of the event.

Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 5.2 to the extent the delay is covered under subclause 5.2 the contractor shall be entitled to only extension of time and no damages.

- 5.4 Request for rescheduling of Mile stones and extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form to the authority as indicated in Schedule 'F'. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

With every request for rescheduling of milestones, or if at any time the actual progress of work falls behind the approved programme by more than 10% of the stipulated period of completion of contract, the contractor shall produce a revised programme which shall include all details of pending drawings and decisions required to complete the contract and also the target dates by which these details should be available without causing any delay in execution of the work. A recovery of Rs.5000/- (Rs. Five Thousand Only) shall be made on per day basis in case of delay in submission of the revised programme.

- 5.4.1 In any such case the authority as indicated in Schedule 'F' may give a fair and reasonable extension of time and reschedule the mile stones for completion of work. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Schedule 'F' in writing, within 3 months of the date of receipt of such request. Non application by the contractor for extension of time/rescheduling of milestones shall not be a bar for giving a fair and reasonable extension/rescheduling of milestones by the authority as indicated in Schedule 'F' and this shall be binding on the contractor.



- 5.5 In case the work is delayed by any reasons, in the opinion of the Engineer-in-Charge, by the contractor for reasons beyond the events mentioned in clause 5.2 or clause 5.3 or clause 5.4 and beyond the justified extended date; without prejudice to right to take action under Clause 3, the Engineer-in-Charge may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.

## **CLAUSE 6**

### **MEASUREMENTS OF WORK DONE**

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done.

All measurement of all items having financial value shall be entered in Measurement Book and/or level field book so that a complete record is obtained of all works performed under the contract.

All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and the Department shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, then a mutually agreed method shall be followed.

The contractor shall give, not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work, before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his

authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that recording of measurements of any item of work in the measurement book and/or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

## **CLAUSE 6A**

### **COMPUTERIZED MEASUREMENT BOOK**

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract. All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per the format of the department so that a complete record is obtained of all the items of works performed under the contract.

All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance.

Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked/test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to the department a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and/or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks/test checks.

The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by the department. Thereafter, the MB shall be

taken in the Engineer- in- charge's Office records, and allotted a number as per the Register of Computerised MBs. This should be done before the corresponding bill is submitted to the Division Office for payment. The contractor shall submit two spare copies of such computerized MB's for the purpose of reference and record by the various officers of the department.

The contractor shall also submit to the department separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages machine numbered along with two spare copies of the bill. Thereafter, this bill will be processed by the Division Office and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/levels by the Engineer-in-Charge or his representative.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The contractor shall give not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

## **CLAUSE 7**

**PAYMENT ON INTERMEDIATE CERTIFICATE TO BE REGARDED AS ADVANCES**

No payment shall be made for work, estimated to cost Rs. Twenty thousand or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs. Twenty thousand, the interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of the Department in triplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment/adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Schedule 'F', in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work. In the event of the failure of the contractor to submit the bills, Engineer-in-Charge shall prepare or cause to be prepared such bills in which event no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer-in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The amount admissible shall be paid by 10th working day after the day of presentation of the bill, along with all supporting documents by the Contractor to the Engineer-in-Charge or his authorized representative together with the account of the material issued by the department, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer-in-Charge, the period of ten working days will be extended to thirty days.

In case of delay in payment of intermediate bills after 45 days of submission of bill by the contractor provided the bill submitted by the contractor found to be in order, a simple interest @ 7.5% per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis.

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.

Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the department to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.

The Engineer-in-Charge in his sole discretion on the basis of a certificate from his authorized representative in-charge of the work at site to the effect that the work has been completed up to the level in question make interim advance payments without detailed

measurements for work done (other than foundations, items to be covered under finishing items) up to lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill by taking detailed measurements thereof.

#### **CLAUSE 7A**

No running account bill shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the contractor to the Engineer-in-charge.

#### **CLAUSE 8**

##### **COMPLETION CERTIFICATE AND COMPLETION PLANS**

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work and if there is no defect in the work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution; thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this Clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose of the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

#### **CLAUSE 8A**

##### **CONTRACTOR TO KEEP SITE CLEAN**

When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc., on walls, floor, windows, etc shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done: without waiting for the actual completion of all the other items of work in the contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in-Charge shall have the right to get this work done at the cost of the contractor either

departmentally or through any other agency. Before taking such action, the Engineer-in-Charge shall give ten days' notice in writing to the contractor.

## **CLAUSE 8B**

### **COMPLETION PLANS TO BE SUBMITTED BY THE CONTRACTOR**

The contractor shall submit completion plan as required vide General Specifications for Electrical works (Part-I internal) 2005 and (Part-II External) 1994 as applicable within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum equivalent to 0.1% of the value of the work subject to a ceiling of Rs.5,00,000 (Rs. Five Lakhs only) as may be fixed by the Engineer- in- charge concerned and in this respect the decision of the Engineer- in- charge shall be final and binding on the contractor.

The Contractor shall submit completion plan for Internal and External Civil, Electrical, PHE, Fire Fighting, HVAC,water, sewerage and drainage line plan within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, the department will get it done through other agency at his cost and actual expenses incurred plus Rs. 15000/- for the same shall be recovered from the contractor.

## **CLAUSE 9**

### **PAYMENT OF FINAL BILL**

The final bill shall be submitted by the contractor,along with all supporting documents, in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished bythe Engineer-in-Charge whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within the period specified hereinunder, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his authorized Engineer, complete with account of materials issued by the Department and dismantled materials.

- |       |  |          |
|-------|--|----------|
| (i)   | If the Tendered value of work is up to Rs. 45 lac:                             | 2 Months |
| (ii)  | If the Tendered value of work is more than Rs. 45 lac and up to Rs. 2.5 Crore: | 3 Months |
| (iii) | If the Tendered value of work exceeds Rs. 2.5 Crore:                           | 6 Months |

In case of delay in payment of final bills after prescribed time limit, a simple interest @ 7.5% per annum shall be paid to the contractor from the date of expiry of prescribed time limit, provided the final bill submitted by the contractor found to be in order.

**CLAUSE 9A****PAYMENT OF CONTRACTOR'S BILLS TO BANKS**

Payments due to the contractor may, if so desired by him, be made to his bank, registered financial, co-operative or thrift societies or recognized financial institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank; registered financial, co-operative or thrift societies or recognized financial institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by Government or his signature on the bill or other claim preferred against Government before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, co-operative or thrift societies or recognized financial institutions. While the receipt given by such banks; registered financial, co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall whenever possible present his bills duly receipted and discharged through his bank, registered financial, co-operative or thrift societies or recognized financial institutions.

Nothing herein contained shall operate to create in favour of the bank; registered financial, co-operative or thrift societies or recognized financial institutions any rights or equities vis-a-vis the HSCC (I) Ltd. (*Executing Agency*).

**CLAUSE 10****MATERIALS SUPPLIED BY GOVERNMENT**

Materials which Government will supply are shown in Schedule 'B' which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from the Engineer-in-Charge.

As soon as the work is awarded, the contractor shall finalise the programme for the completion of work as per clause 5 of this contract and shall give his estimates of materials required on the basis of drawings/or schedule of quantities of the work. The Contractor shall give in writing his requirement to the Engineer-in-Charge which shall be issued to him keeping in view the progress of work as assessed by the Engineer-in-Charge, in accordance with the agreed phased programme of work indicating monthly requirements of various materials. The contractor shall place his indent in writing for issue of such materials at least 7 days in advance of his requirement.

Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the contractor under the contract or otherwise or from the security deposit. At the time of submission of bills, the contractor shall certify that balance of materials supplied is available at site in original good condition. ,

The contractor shall submit along with every running bill (on account or interim bill) material-wise reconciliation statements supported by complete calculations reconciling total issue, total consumption and certified balance (diameter/section-wise in the case of steel) and resulting variations and reasons thereof. Engineer-in-Charge shall (whose decision shall be final and binding on the contractor) be within his rights to follow the procedure of recovery in clause 42 at any stage of the work if reconciliation is not found to be satisfactory.

The contractor shall bear the cost of getting the material issued, loading, transporting to site, unloading, storing under cover as required, cutting assembling and joining the several parts together as necessary. Notwithstanding anything to the contrary contained in any other clause of the contract and (or the CPWA Code) all stores/materials so supplied to the contractor or procured with the assistance of the Government shall remain the absolute property of Government and the contractor shall be the trustee of the stores/materials, and the said stores/materials shall not be removed/disposed off from the site of the work on any account and shall be at all times open to inspection by the Engineer-in-Charge or his authorized agent. Any such stores/materials remaining unused shall be returned to the Engineer-in-Charge in as good a condition in which they were originally supplied at a place directed by him, at a place of issue or any other place specified by him as he shall require, but in case it is decided not to take back the stores/materials the contractor shall have no claim for compensation on any account of such stores/materials so supplied to him as aforesaid and not used by him or for any wastage in or damage to in such stores/materials.

On being required to return the stores/materials, the contractor shall hand over the stores/materials on being paid or credited such price as the Engineer-in-Charge shall determine, having due regard to the condition of the stores/materials. The price allowed for credit to the contractor, however, shall be at the prevailing market rate not exceeding the amount charged to him, excluding the storage charge, if any. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to account for contravention of the terms of the licences or permit and/or for criminal breach of trust, be liable to Government for all advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach. Provided that the contractor shall in no case be entitled to any compensation or damages on account of any delay in supply or non-supply thereof all or any such materials and stores provided further that the contractor shall be bound to execute the entire work if the materials are supplied by the Government within the original scheduled time for completion of the work plus 50% thereof or schedule time plus 6 months whichever is more if the time of completion of work exceeds 12 months, but if a part of the materials only has been supplied within the aforesaid period, then the contractor shall be bound to do so much of the work as may be possible with the materials and stores supplied in the aforesaid period. For the completion of the rest of the work, the contractor shall be entitled to such extension of time as may be determined by the Engineer-in-Charge whose decision in this regard shall be final and binding on the contractor.

The contractor shall see that only the required quantities of materials are got issued. Any such material remaining unused and in perfectly good/original condition at the time of completion or determination of the contract shall be returned to the Engineer-in-Charge at the stores from which it was issued or at a place directed by him by a notice in writing. The



contractor shall not be entitled for loading, transporting, unloading and stacking of such unused material except for the extra lead, if any involved, beyond the original place of issue.

## **CLAUSE 10A**

### **MATERIALS TO BE PROVIDED BY THE CONTRACTOR**

The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the Government.

The contractor shall, at his own expense and without delay, supply to the Engineer-in-Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the Engineer-in-Charge shall be issued after the test results are received.

The Contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor.

The contractor shall, at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped at least with the testing equipment as specified in schedule F.

## **CLAUSE 10B**

### **(i) SECURED ADVANCE ON NON-PERISHABLE MATERIAL**

The contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to 75% of the assessed value of any materials which are in the opinion of the Engineer-in-Charge non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered/ deducted from the next payment made under any of the clause or clauses of this contract.

Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

### **(ii) MOBILISATION ADVANCE**

Mobilization advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be in two or more installments to be determined by the Engineer-in-Charge at his sole discretion. The first installment of such advance shall be released by the Engineer-in-charge to the contractor on a request made by the contractor to the Engineer-in-Charge in this behalf. The second and subsequent installments shall be released by the Engineer-in-Charge only after the contractor furnishes a proof of the satisfactory utilization of the earlier installment to the entire satisfaction of the Engineer-in-Charge.

Before any installment of advance is released, the contractor shall execute a Bank guarantee Bond from scheduled Bank for the amount equal to 110% of the amount of advance valid for the Contract Period. This (Bank Guarantee from Scheduled Bank for the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery, together with interest.

Provided always that provision of Clause 10 B (ii) shall be applicable only when so provided in 'Schedule F'.

**(iii) PLANT MACHINERY & SHUTTERING MATERIAL ADVANCE**

An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant & machinery, which in the opinion of the Engineer-in-Charge, will add to the expeditious execution of work and improve the quality of work. The amount of advance shall be restricted to 5% percent of the tender value. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Engineer-in-Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer-in-Charge. The contractor shall, if so required by the Engineer-in-Charge, submit the statement of value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income- Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/- Seventy five per cent of such amount of advance shall be paid after the plant & equipment is brought to site and balance twenty five percent on successfully commissioning the same.

Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:

1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
2. Engineer in Charge, and
3. The contractor.

This advance shall further be subject to the condition that such plant and equipment (a) are considered by the Engineer-in-Charge to be necessary for the works; (b) and are in working order and are maintained in working order; (c) hypothecated to the Government as specified by the Engineer-in-Charge before the payment of advance is released. The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Engineer- in-Charge. The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period of hypothecation failing which such advance shall be entirely recovered in lump sum. For this purpose, steel scaffolding and form work shall be treated as plant and equipment.

The contractor shall insure the Plant and Machinery for which mobilization advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.

Provided always the provision of Clause 10 B (iii) shall be applicable only when so provided in Schedule 'F'.

**Interest & Recovery**

- (iv) The mobilization advance and plant and machinery advance in (ii) & (iii) above bear simple interest at the rate of 10 per cent per annum and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractors bills commencing after first ten per cent of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount upto the date of recovery of the installment. .
- (v) If the circumstances are considered reasonable by the Engineer-in-Charge, the period mentioned in (ii) and (iii) for request by the contractor in writing for grant of mobilization advance and plant and equipment advance may be extended in the discretion of the Engineer-in-Charge.

**CLAUSE 10C****PAYMENT ON ACCOUNT OF INCREASE IN PRICES/WAGES DUE TO STATUTORY ORDER(S)**

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any variation of rates in GST applicable on such material(s) being considered under this clause) beyond the prices/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied.

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes of rate in sales tax/VAT, Central/State Excise/Custom Duty), Government shall in respect of materials incorporated in the works (excluding the materials covered under Clause 10CA and not being material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order. This will be applicable for the

contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

Engineer-in-Charge shall call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages.

The contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and/or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.

For this purpose, the labour component of 85% of the value of the work executed during period under consideration shall not exceed the percentage as specified in Schedule F, of the value of work done during that period and the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled mazdoor, fixed under any law, statutory rule or order.

#### **CLAUSE 10 CA**

##### **PAYMENT DUE TO VARIATION IN PRICES OF MATERIALS AFTER RECEIPT OF TENDER**

If after submission of the tender, the price of materials specified in Schedule F increases/decreases beyond the base price(s) as indicated in Schedule F prevailing at the time of the last stipulated date for receipt of tenders (including extensions, if any) for the work, then the amount of the contract shall accordingly be varied and provided further that any such variations shall be effected for stipulated period of Contract including the justified period extended under the provisions of Clause 5 of the Contract without any action under Clause 2. However for work done/during the justified period extended as above, it will be limited to indices prevailing at the time of updated stipulated date of completion considering the effect of extra work ( to be calculated on pro-rata basis as cost of extra work x stipulated period/tendered cost).

The increase/decrease in prices of cement, steel reinforcement, structural steel and POL shall be determined by the Price indices issued by the Director General, CPWD. For other items provided in the Schedule 'F', this shall be determined by the All India Wholesale Price Indices of materials as published by Economic Advisor to Government of India, Ministry of Commerce and Industry. Base price for cement, steel reinforcement, structural steel and POL shall be as issued under the authority of Director General CPWD applicable for Delhi including Noida, Gurgaon, Faridabad & Ghaziabad and for other places as issued under the authority of Zonal Chief Engineer, CPWD and base price of other materials issued by concerned Zonal Chief Engineer as indicated in Schedule 'F' as valid on the last stipulated date of receipt of tender, including extension if any and for the period under consideration. In case, price index of a particular material is not issued by Ministry of Commerce and Industry, then the price index of nearest similar material as indicated in Schedule 'F' shall be followed.

The amount of the contract shall accordingly be varied for all such materials and will be worked out as per the formula given below for individual material:-

Adjustment for component of individual material

CI - C<sub>10</sub>

$$V = P \times Q \times \frac{\text{Cio}}{\text{C}}$$

where,

V = Variation in material cost i.e. increase or decrease in the amount of rupees to be paid or recovered.

P = Base Price of material as issued under authority of DG, CPWD or concerned Zonal Chief Engineer as indicated in Schedule "F"

#### **For Projects and Original Works**

Q = Quantity of material brought at site for bonafide use in the works since previous bill excluding any such quantity consumed in the deviated quantity of items beyond deviation limit and extra/substituted items, paid/to be paid at rates derived on the basis of market rate under Clause 12.2.

Cio = Price index for cement, steel reinforcement bars, structural steel and POL as issued by the DG, CPWD as valid on the last stipulated date of receipt of tenders including extensions, if any. For other items, if any, provided in Schedule 'F', All India Wholesale Price Index for the material as published by the Economic Advisor to Government of India, Ministry of Industry and Commerce as valid on the last stipulated date of receipt of tenders including extensions, if any.

Cl = Price index for cement, steel reinforcement bars, structural steel and POL as issued under the authority of DG, CPWD for period under consideration. For other items, if any, provided in Schedule 'F', All India Wholesale Price Index for the material for period under consideration as published by Economic Advisor to Government of India, Ministry of Industry and Commerce.

Note : (i) In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work X stipulated period /tendered cost).

Provided always that provisions of the preceding Clause 10 C shall not be applicable in respect of Materials covered in this Clause.

(ii) If during progress of work or at the time of completion of work, it is noticed that any material brought at site is in excess of requirement, then amount of escalation if paid earlier on such excess quantity of material shall be recovered on the basis of cost indices as applied at the time of payment of escalation or as prevailing at the time of effecting recovery, whichever is higher.

(iii) Cement mentioned wherever in this clause includes cement component used in RMC brought at site from outside approved RMC plants, if any.

(iv) The date wise record of ready mix concrete shall be kept in a register and the cement consumption for the same shall be calculated accordingly.

(v) If built-up steel items are brought at site from workshop, then the variation shall be

paid for the structural steel up to the period when the built up item/finished product is brought at site.

#### **CLAUSE 10 CC**

#### **PAYMENT DUE TO INCREASE/DECREASE IN PRICES/ WAGES (EXCLUDING MATERIALS COVERED UNDER CLAUSE 10 (CA) AFTER RECEIPT OF TENDER FOR WORKS)**

If the prices of materials (not being materials supplied or services rendered at fixed prices by the department in accordance with clause 10 & 34 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2. No such compensation shall be payable for a work for which the stipulated period of completion is equal to or less than the time as specified in Schedule F. Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the following provisions:-

- (i) The base date for working out such escalation shall be the last stipulated date of receipt of tenders including extension, if any.

The cost of work on which escalation will be payable shall be reckoned as below:

- |  |     |
|--|-----|
| (a) Gross value of work done upto this quarter:  | (A) |
| (b) Gross Value of work done upto the last quarter:  | (B) |
| (c) Gross value of work done since previous quarter (A-B):   | (C) |
| (d) Full assessed value of Secured Advance (excluding materials covered under clause 10CA) fresh paid in this quarter:   | (D) |
| (e) Full assessed value of Secured Advance (excluding materials covered under clause 10CA) recovered in this quarter:    | (E) |
| (f) Full assessed value of Secured Advance for which escalation is payable in this quarter (D-E):                        | (F) |
| (g) Advance payment made during this quarter:  | (G) |
| (h) Advance payment recovered during this quarter:   | (H) |
| (i) Advance payment for which escalation is payable in this quarter (G-H):   | (I) |
| (j) Extra Items/deviated quantities of items paid as per Clause 12 based on prevailing market rates during this quarter: | (J) |

$$\text{Then, } M = C + F + I - J$$

$$N = 0.85 M$$

- (k) Less cost of material supplied by the department as per Clause 10 and (K) recovered during the quarter:
- (l) Less cost of services rendered at fixed charges as per Clause 34 and (L) recovered during the quarter

**Cost of work for which escalation is applicable:  $W = N - (K + L)$**

- (iii) Components for materials (except cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA) labour, etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in Schedule 'F'. The decision of the Engineer-in-Charge in working out such percentage shall be binding on the contractors.
- (iv) The compensation for escalation for other materials (excluding cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA) shall be worked as per the formula given below:-

Adjustment for civil component (except cement, structural steel, reinforcement bars, POL and other materials covered under clause 10CA) / electrical component of construction 'Materials'

$$V_m = W \times \frac{X_m}{100} \times \frac{M_I - M_{I0}}{M_{I0}}$$

$V_m$  = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

$W$  = Cost of Work done worked out as indicated in sub-para (ii) of Clause 10CC.

$X_m$  = Component of 'materials' (except cement, structural steel, reinforcement bars, POL and other materials covered under clause 10CA) expressed as percent of the total value of work.

$M_I$  = All India Wholesale Price Index for civil component/electrical component\* of construction material as worked out on the basis of All India Wholesale Price Index for Individual Commodities/ Group Items for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group Items. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on the pro-rata basis only as cost of extra work  $X$  stipulated period / tendered cost).

$M_{I0}$  = All India Wholesale Price Index for civil component/electrical component\* of construction material as worked out on the basis of All India Wholesale Price Index for Individual Commodities/Group Items valid on the last stipulated date of receipt of tender including extension, if any, as



published by the Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group items.

\*Note: relevant component only will be applicable.

- (v) The following principles shall be followed while working out the indices mentioned in para (iv) above.
- (a) The compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter. The dates of preparation of bills as finally entered in the Measurement Book by the Engineer-in-Charge's representative /date of submission of bill finally by the Contractor to the Department in case of computerized measurement books shall be the guiding factor to decide the bills relevant to the quarterly interval. The first such payment shall be made at the end of three months after the month (excluding the month in which tender was accepted) and thereafter at three months' interval. At the time of completion of the work, the last period for payment might become less than 3 months, depending on the actual date of completion.
- (b) The index (MI/FI etc.) relevant to any quarter/period for which such compensation is paid shall be the arithmetical average of the indices relevant to the three calendar months. If the period up to date of completion after the quarter covered by the last such installment of payment, is less than three months, the index MI and FI shall be the average of the indices for the months falling within that period.
- (vi) The compensation for escalation for labour shall be worked out as per the formula given below:-

$$VL = W \times \frac{Y}{100} \times \frac{LI - LI0}{LI0}$$

VL: Variation in labour cost i.e. amount of increase or decrease in rupees to be paid or recovered.

W : Value of work done, worked out as indicated in sub-para (ii) above.

Y : Component of labour expressed as a percentage of the total value of the work.

LI : Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to updated stipulated date of completion considering the effect of extra work (extra time to be calculated on the pro-rata basis only as cost of extra work X stipulated period / tendered cost).

- Llo : Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last stipulated date of receipt of tender including extension, if any.
- (vii) The following principles will be followed while working out the compensation as per sub-para (vi) above.
- (a) The minimum wage of an unskilled mazdoor mentioned in sub-para (vi) above shall be the higher of the wage notified by Government of India, Ministry of Labour and that notified by the local administration both relevant to the place of work and the period of reckoning.
  - (b) The escalation for labour also shall be paid at the same quarterly intervals when escalation due to increase in cost of materials and/or P.O.L. is paid under this clause. If such revision of minimum wages takes place during any such quarterly intervals, the escalation compensation shall be payable at revised rates only for work done in subsequent quarters;
  - (c) Irrespective of variations in minimum wages of any category of labour, for the purpose of this clause, the variation in the rate for an unskilled mazdoor alone shall form the basis for working out the escalation compensation payable on the labour component.
- (viii) In the event the price of materials and/or wages of labour required for execution of the work decrease/s, there shall be a downward adjustment of the cost of work so that such price of materials and/or wages of labour shall be deductible from the cost of work under this contract and in this regard the formula herein before stated under this Clause 10CC shall mutatis mutandis apply, provided that:
- (a) no such adjustment for the decrease in the price of materials and/or wages of labour aforementioned would be made in case of contracts in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule 'F'.
  - (b) the Engineer-in-Charge shall otherwise be entitled to lay down the procedure by which the provision of this sub-clause shall be implemented from time to time and the decision of the Engineer-in-Charge in this behalf shall be final and binding on the contractor.
- (ix) Provided always that:-
- (a) Where provisions of clause 10CC are applicable, provisions of clause 10C will not be applicable but provisions of clause 10CA will be applicable.
  - (b) Where provisions of clause 10CC are not applicable, provisions of clause 10C and 10CA will become applicable.
- Note: Updated stipulated date of completion for compensation under Clause 10C, 10CA & 10CC. The factor of 1.25 taken into account for calculating the extra time under clause 12.1 for extra work shall not be considered while calculating the updated stipulated date of completion for this purpose in clause 10C, clause 10CA and clause 10CC.

## **CLAUSE 10 D**

### **DISMANTLED MATERIAL GOVT. PROPERTY**

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as Government's property and such materials shall be disposed off to the best advantage of Government according to the instructions in writing issued by the Engineer-in-Charge.

## **CLAUSE 11**

### **WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS ETC.**

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications of Central Public Works Department specified in Schedule 'F' or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

## **CLAUSE 12**

### **DEVIATIONS/ VARIATIONS EXTENT AND PRICING**

The Engineer-in-Charge shall have power (i) to make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

- 12.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extended, if requested by the contractor, as follows:
- (i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus
  - (ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

## **DEVIATION, EXTRA ITEMS AND PRICING**

### 12.2

In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the Engineer-in-charge shall within prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

### **Deviation, Substituted Items, Pricing**

In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para.

- (a) If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).
- (b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

### **Deviation, Deviated Quantities, Pricing**

In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in schedule F, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, the Engineer-in-Charge shall within prescribed time limit of

receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

The prescribed time limits are:

- |       |  |         |
|-------|--|---------|
| (i)   | If the Tendered value of work is up to Rs. 45 lac:                             | 30 Days |
| (ii)  | If the Tendered value of work is more than Rs. 45 lac and up to Rs. 2.5 Crore: | 45 Days |
| (iii) | If the Tendered value of work exceeds Rs. 2.5 Crore:                           | 60 Days |

**12.3** The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in Schedule F, and the Engineer- in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

**12.4** The contractor shall send to the Engineer-in-Charge once every three months, an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge which he has executed during the preceding quarter failing which the contractor shall be deemed to have waived his right. However, the Engineer- in- charge may authorise consideration of such claims on merits.

**12.5** For the purpose of operation of Schedule "F", the following works shall be treated as works relating to foundation unless & otherwise defined in the contract:

- (i) For Buildings : All works up to 1.2 metres above ground level or up to floor 1 level whichever is lower.
- (ii) For abutments, piers and well staining: All works up to 1.2 m above the bed level.
- (iii) For retaining walls, wing walls, compound walls, chimneys, overhead reservoirs/tanks and other elevated structures: All works up to 1.2 metres above the ground level.
- (iv) For reservoirs/tanks (other than overhead reservoirs/tanks) : All works up to 1.2 metres above the ground level.
- (v) For basement: All works up to 1.2 m above ground level or up to floor 1 level whichever is lower.
- (vi) For Roads, all items of excavation and filling including treatment of sub base.

**12.6** Any operation incidental to or necessarily has to be in contemplation of tenderer while filing tender, or necessary for proper execution of the item included in the Schedule of quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given

in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.

### **CLAUSE 13**

#### **FORECLOSURE OF CONTRACT DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK**

If at any time after acceptance of the tender or during the progress of work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope the Engineer-in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates, full amount for works executed at site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilized on the work to the full extent in view of the foreclosure;

- (i) Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office; storage accommodation and water storage tanks.
- (ii) Government shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided, however Government shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by Government, cost of such materials as detailed by Engineer-in-Charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.
- (iii) If any materials supplied by Government are rendered surplus, the same except normal wastage shall be returned by the contractor to Government at rates not exceeding those at which these were originally issued, less allowance for any deterioration or damage which may have been caused whilst the materials were in the custody of the contractor. In addition, cost of transporting such materials from site to Government stores, if so required by Government, shall be paid.
- (iv) Reasonable compensation for transfer of T & P from site to contractor's permanent stores or to his other works, whichever is less. If T& P are not transported to either of the said places, no cost of transportation shall be payable.
- (v) Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Engineer- in-Charge, furnish to him, books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition.

The reasonable amount of items on (i), (iv) and (v) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor's materials at site taken over by the Government as per item (ii) above. Provided always that against any payments due to the contractor on this account or otherwise, the Engineer-in-Charge shall be entitled to recover or be credited with any outstanding balances due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Government from the contractor under the terms of the contract.

In the event of action being taken under Clause 13 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.

#### **CLAUSE 14**

##### **CARRYING OUT PART WORK AT RISK & COST OF CONTRACTOR**

If contractor:

- (i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Engineer-in-Charge; or
- (ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge; or
- (iii) Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge.

The Engineer- in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to Government, by a notice in writing to take the part work / part incomplete work of any item(s) out of his hands and shall have powers to:

- (a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or
- (b) Carry out the part work / part incomplete work of any item(s) by any means at the risk and cost of the contractor.

The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on

account of loss or damage suffered by Government because of action under this clause shall not exceed 10% of the tendered value of the work.

In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the department are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.

Any excess expenditure incurred or to be incurred by Government in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by Government as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Government in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

In the event of above course being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.

## **CLAUSE 15**

### **SUSPENSION OF WORK**

- (i) The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:
  - (a) on account of any default on the part of the contractor or;
  - (b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or
  - (c) for safety of the works or part thereof.



The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer- in-Charge.

- (ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:
- (a) the contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part, and;
  - (b) If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Engineer-in-Charge may consider reasonable in respect of salaries and/or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within fifteen days of the expiry of the period of 30 days.
- (iii) If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than three months at a time, except when suspension is ordered for reason (a) in sub-para (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by Government or where it affects whole of the works, as an abandonment of the works by Government, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by Government, he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3 months.

#### **CLAUSE 15A**

The Contractor shall not be entitled to claim any compensation from *the Executing Agency/Government* for the loss suffered by him on account of delay by Government in the supply of materials in schedule 'B' where such delay is covered by difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of *the Executing Agency/ Government*.

This Clause 15A will not be applicable for works where no material is stipulated.

## **CLAUSE 16**

### **ACTION IN CASE WORK NOT DONE AS PER SPECIFICATIONS**

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in-charge, his authorized subordinates in charge of the work and all the superior officers, officer of the Quality Assurance Unit of the Department or any organization engaged by the Department for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-charge or his authorized subordinates in-charge of the work or to the Chief Engineer in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the Department for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in the case of work costing Rs. 10 Lac and below except road work) of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in- Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default.

In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in schedule 'F' may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

## **CLAUSE 17**

### **CONTRACTOR LIABLE FOR DAMAGES, DEFECTS DURING MAINTENANCE PERIOD**

If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road kerb,

fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later. Provided that in the case of road work, if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient, to meet all liabilities of the contractor under this contract, half of the security deposit will be refundable after six months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.

In case of Maintenance and Operation works of E&M services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the maintenance contract whichever is earlier.

## **CLAUSE 18**

### **CONTRACTOR TO SUPPLY TOOLS & PLANTS ETC.**

The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & plants as specified in schedule F. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

**CLAUSE 18A****RECOVERY OF COMPENSATION PAID TO WORKMEN**

In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen's Compensation Act, 1923, Government is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Government will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the Government under sub-section (2) of Section 12, of the said Act, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this contract or otherwise. Government shall not be bound to contest any claim made against it under sub-section (1) of Section 12, of the said Act, except on the written request of the contractor and upon his giving to Government full security for all costs for which Government might become liable in consequence of contesting such claim.

**CLAUSE 18B****ENSURING PAYMENT AND AMENITIES TO WORKERS IF CONTRACTOR FAILS**

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, Government is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under Clause 19H or under the C.P.W.D. Contractor's Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by C.P.W.D. Contractors, Government will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the Government under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this contract or otherwise Government shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to the Government full security for all costs for which Government might become liable in contesting such claim.

**CLAUSE 19****LABOUR LAWS TO BE COMPLIED BY THE CONTRACTOR**

The contractor shall obtain a valid licence under the Contract Labour (R&A) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

The contractor shall also comply with provisions of the Inter-State migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.

Any failure to fulfill these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.

#### **CLAUSE 19A**

No labour below the age of fourteen years shall be employed on the work.

#### **CLAUSE 19 B**

##### **PAYMENT OF WAGES**

Payment of wages:

- (i) The contractor shall pay to labour employed by him either directly or through sub-contractors, wages not less than fair wages as defined in the C.P.W.D. Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.
- (ii) The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.
- (iii) In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the Central Public Works Department contractor's Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorizedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.
- (iv) (a) The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.  
  
(b) Under the provision of Minimum Wages (Central) Rules, 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 days continuous work and pay wages at the same rate as for duty. In the

event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge concerned.

In the case of Union Territory of Delhi, however, as the all-inclusive minimum daily wages fixed under Notification of the Delhi Administration No.F.12(162)MWO/DAB/43884-91, dated 31-12-1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.

- (v) The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made thereunder from time to time.
- (vi) The contractor shall indemnify and keep indemnified Government against payments to be made under and for the observance of the laws aforesaid and the C.P.W.D. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.
- (vii) The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.
- (viii) Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.
- (ix) The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

#### **CLAUSE 19C**

In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per C.P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs.200/- for each default and in addition, the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

#### **CLAUSE 19 D**

The contractor shall submit by the 4th and 19th of every month, to the Engineer-in-Charge, a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively:-

- (1) the number of labourers employed by him on the work,
- (2) their working hours,
- (3) the wages paid to them,
- (4) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and
- (5) the number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.

Failing which the contractor shall be liable to pay to Government, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Engineer in charge shall be final in deducting from any bill due to the contractor; the amount levied as fine and be binding on the contractor.

#### **CLAUSE 19E**

In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the Central Public Works Department and its contractors.

#### **CLAUSE 19 F**

Leave and pay during leave shall be regulated as follows:-

1. Leave :
  - (i) in the case of delivery - maternity leave not exceeding 8 weeks, 4 weeks up to and including the day of delivery and 4 weeks following that day,
  - (ii) in the case of miscarriage - upto 3 weeks from the date of miscarriage.
2. Pay :
  - (i) in the case of delivery - leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on total wages earned on the days when full time work was done during a period of three months immediately preceding the date on which she gives notice that she expects to be confined or at the rate of Rupee one only a day whichever is greater.
  - (ii) in the case of miscarriage - leave pay at the rate of average daily earning calculated on the total wages earned on the days when full time work was done during a period of three months immediately preceding the date of such miscarriage.
3. Conditions for the grant of Maternity Leave:

No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than six months immediately preceding the date on which she proceeds on leave.

4. The contractor shall maintain a register of Maternity (Benefit) in the Prescribed Form as shown in appendix -I and II, and the same shall be kept at the place of work.

#### **CLAUSE 19 G**

In the event of the contractor(s) committing a default or breach of any of the provisions of the Central Public Works Department, Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and' Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Government a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 per cent of the estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the parties.

Should it appear to the Engineer-in-Charge that the contractor(s) is/are not properly observing and complying with the provisions of the C.P.W.D. Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R& A) Central Rules 1971, for the protection of health and sanitary arrangements for work-people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/observe the said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities hereinbefore mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodelled and/or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

#### **CLAUSE 19H**

The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge.

- (i) (a) The minimum height of each hut at the eaves level shall be 2.10m (7 ft.) and the floor area to be provided will be at the rate of 2.7 sq.m. (30 sq.ft.) for each member of the worker's family staying with the labourer.



- (b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6'x5') adjacent to the hut for each family.
  - (c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.
  - (d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.
- (ii) (a) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobi on both sides. The floor may be kutcha but plastered with mud gobi and shall be at least 15 cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation, the roofs remain water-tight.
- (b) The contractor(s) shall provide each hut with proper ventilation.
  - (c) All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.
  - (d) There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.
- (iii) Water Supply - The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipe lines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.
- (iv) The site selected for the camp shall be high ground, removed from jungle.
- (v) Disposal of Excreta - The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

- (vi) Drainage - The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy.
- (vii) The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.
- (viii) Sanitation - The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

#### **CLAUSE 19I**

The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors' employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. The Engineer-in-Charge will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service centre, to apprise the residents about the same.

#### **CLAUSE 19J**

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorisedly during construction, and is handed over to the Engineer-in-Charge with vacant possession of complete building. If such building though completed is occupied illegally, then the Engineer-in-Charge shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy upto 5% of tendered value of work may be imposed by the Engineer-in-Charge whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However, the Engineer-in-charge, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

#### **CLAUSE 19K**

##### **EMPLOYMENT OF SKILLED/SEMI SKILLED WORKERS**

The contractor shall, at all stages of work, deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/Industrial Training Institute/National Institute of construction Management and Research (NICMAR)/ National Academy of Construction, CIDC, National Skill Development Corporation certified training institute or any similar reputed and recognized Institute managed/ certified by State/Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer in charge for approval. Notwithstanding such

approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer- in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer in Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

Provided always, that the provisions of this clause shall not be applicable for works with estimated cost put to tender being less than Rs. 5 crores.

#### **CLAUSE 19L**

The ESI and EPF contributions on the part of the *Executing Agency* in respect of this Contract shall be paid by the Contractor. These contributions on the part of the *Executing Agency* paid by the contractor shall be reimbursed by the Engineer-in-charge to the Contractor on actual basis.

#### **CLAUSE 20**

##### **MINIMUM WAGES ACT TO BE COMPLIED WITH**

The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation and Abolition) Act, 1970, amended from time to time and rules framed thereunder and other labour laws affecting contract labour that may be brought into force from time to time.

#### **CLAUSE 21**

##### **WORK NOT TO BE SUBLET. ACTION IN CASE OF INSOLVENCY**

The contract shall not be assigned or sublet without the written approval of the Engineer-in - Charge. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of Government in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge on behalf of the Client shall have power to adopt the course specified in Clause 3 hereof in the interest of Government and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue.

#### **CLAUSE 22**

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

**CLAUSE 23****CHANGES IN FIRM'S CONSTITUTION TO BE INTIMATED**

Where the contractor is a partnership firm, the previous approval in writing of the Engineer- in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21.

**CLAUSE 24**

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

**CLAUSE 25****SETTLEMENT OF DISPUTES & ARBITRATION**

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

- (i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge or if the Engineer in Charge considers any act or decision of the contractor on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable and is disputed, such party shall promptly within 15 days of the arising of the disputes request the Director (E), HSCC India Ltd. who shall refer the disputes to Dispute Redressal Committee (DRC) within 15 days along with a list of disputes with amounts claimed if any in respect of each such dispute. The DisputeRedressalCommittee (DRC) shall give the opposing party two weeks for a written response, and, give its decision within a period of 60 days extendable by 30 days by consent of both the parties from the receipt of reference from Director (E), HSCC India Ltd.. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule 'F'. Provided that no party shall be represented before the Dispute Redressal Committee by an advocate/legal counsel etc. If the Dispute Redressal Committee (DRC) fails to give its decision within the aforesaid period or any party is dissatisfied with the decision of Dispute Redressal Committee (DRC) or expiry of time limit given above, then either party may within a period of 30

days from the receipt of the decision of Dispute Redressal Committee (DRC), give notice to the Director (E), HSCC India Ltd., in charge of the work for appointment of arbitrator on prescribed proforma under intimation to the other party.

It is term of contract that each party invoking arbitration must exhaust the aforesaid mechanism of settlement of claims/disputes prior to invoking arbitration.

The Director (E), HSCC India Ltd. shall in such case appoint the sole arbitrator or one of the three arbitrators as the case may be within 30 days of receipt of such a request and refer such disputes to arbitration. Wherever the Arbitral Tribunal consists of three Arbitrators, the contractor shall appoint one arbitrator within 30 days of making request for arbitration or of receipt of request by Engineer-in-charge to Director (E), HSCC India Ltd. for appointment of arbitrator, as the case may be, and two appointed arbitrators shall appoint the third arbitrator who shall act as the Presiding Arbitrator. In the event of

- a. A party fails to appoint the second Arbitrator, or
  - b. The two appointed Arbitrators fail to appoint the Presiding Arbitrator, then Director (E), HSCC India Ltd. shall appoint the second or Presiding Arbitrator as the case may be.
- (ii) Disputes or difference shall be referred for adjudication through arbitration by a Tribunal having sole arbitrator where Tendered amount is Rs. 100 Crore or less. Where Tendered Value is more than Rs. 100 Crore, Tribunal shall consist of three Arbitrators as above. The requirements of the Arbitration and Conciliation Act, 1996 (26 of 1996) and any further statutory modifications or reenactment thereof and the rules made there under and for the time being in force shall be applicable.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed, if any, in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the decision of the DRC. It is also a term of this contract that any member of the Arbitration Tribunal shall be a Graduate Engineer with experience in handling public works engineering contracts at a level not lower than Chief Engineer (Joint Secretary level of Government of India). This shall be treated as a mandatory qualification to be appointed as arbitrator.

Parties, before or at the time of appointment of Arbitral Tribunal may agree in writing for fast track arbitration as per the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015. Subject to provision in the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015 whereby the counter claims if any can be directly filed before the arbitrator without any requirement of reference by the appointing authority, the arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases where the total amount of the claims by any party exceeds Rs. 1,00,000/-, the arbitrator shall give reasons for the award. It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid as per the Act.

The place of arbitration shall be New Delhi. In case there is no mention of place of arbitration, the arbitral tribunal shall determine the place of arbitration. The venue of the arbitration shall be such place as may be fixed by the Arbitral Tribunal in consultation with both the parties. Failing any such agreement, then the Arbitral Tribunal shall decide the venue.

**CLAUSE 26****CONTRACTOR TO INDEMNIFY GOVT. AGAINST PATENT RIGHTS**

The contractor shall fully indemnify and keep indemnified the *Executing Agency* against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against *Executing Agency* in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise therefrom, provided that the contractor shall not be liable to indemnify the *Executing Agency* if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

**CLAUSE 27****LUMPSUM PROVISIONS IN TENDER**

When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge payable of measurement, the Engineer-in-Charge may at his discretion pay the lump-sum amount entered in the estimate, and the certificate in writing of the Engineer-in-Charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provisions of the clause.

**CLAUSE 28****ACTION WHERE NO SPECIFICATIONS ARE SPECIFIED**

In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers' specifications, if not available then as per District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

**CLAUSE 29****WITHHOLDING AND LIEN IN RESPECT OF SUM DUE FROM CONTRACTOR**

- (i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge or the Government shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Engineer- in-Charge or the Government shall be entitled

to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalisation or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or the Government shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge of the Government or any contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or Government will be kept withheld or retained as such by the Engineer-in-Charge or Government till the claim arising out of or under the contract is determined by the arbitrator (if the contract is governed by the arbitration clause) by the competent court, as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Government shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company as the case may be, whether in his individual capacity or otherwise.

- (ii) Government shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract, etc., to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for Government to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Government to the contractor, without any interest thereon whatsoever.

Provided that the Government shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Engineer-in-charge on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by the Engineer-in-charge.

## **CLAUSE 29A**

### **LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS**

Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the

Engineer-in-Charge or the Government or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or Government or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer- in-Charge or the Government or with such other person or persons.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or the Government will be kept withheld or retained as such by the Engineer-in-Charge or the Government or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

### **CLAUSE 30**

#### **EMPLOYMENT OF COAL MINING OR CONTROLLED AREA LABOUR NOTPERMISSIBLE**

The contractor shall not employ coal mining or controlled area labour falling under any category whatsoever on or in connection with the work or recruit labour from area within a radius of 32 km (20 miles) of the controlled area. Subject as above the contractor shall employ imported labour only i.e., deposit imported labour or labour imported by contractors from area, from which import is permitted.

Where ceiling price for imported labour has been fixed by State or Regional Labour Committees not more than that ceiling price shall be paid to the labour by the contractor.

The contractor shall immediately remove any labourer who maybe pointed out by the Engineer- in-Charge as being a coal mining or controlled area labourer. Failure to do so shall render the contractor liable to pay to Government a sum calculated at the rate of Rs.10/- per day per labourer. The certificate of the Engineer-in-Charge about the number of coal mining or controlled area labourer and the number of days for which they worked shall be final and binding upon all parties to this contract.

It is declared and agreed between the parties that the aforesaid stipulation in this clause is one in which the public are interested within the meaning of the exception in Section 74 of Indian Contract Act, 1872.

Explanation:- Controlled Area means the following areas:

Districts of Dhanbad, Hazaribagh, Jamtara - a Sub-Division under Santhal Pargana Commissionery, Districts of Bankuara, Birbhum, Burdwan, District of Bilaspur.

Any other area which may be declared a Controlled Area by or with the approval of the Central Government.

### **CLAUSE 31**

#### **UNFILTERED WATER SUPPLY**



The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions.

- (i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge.
- (ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in-Charge, unsatisfactory.

### **CLAUSE 31 A**

#### **DEPARTMENTAL WATER SUPPLY, IF AVAILABLE**

Water if available may be supplied to the contractor by the department subject to the following conditions:-

- (i) The water charges @ 1 % shall be recovered on gross amount of the work done.
- (ii) The contractor(s) shall make his/their own arrangement of water connection and laying of pipelines from existing main of source of supply.
- (iii) The Department do not guarantee to maintain uninterrupted supply of water and it will be incumbent on the contractor(s) to make alternative arrangements for water at his/ their own cost in the event of any temporary break down in the Government water main so that the progress of his/their work is not held up for want of water. No claim of damage or refund of water charges will be entertained on account of such break down.

### **CLAUSE 32**

#### **ALTERNATE WATER ARRANGEMENTS**

- (i) Where there is no piped water supply arrangement and the water is taken by the contractor from the wells or hand pump constructed by the Government, no charge shall be recovered from the contractor on that account. The contractor shall, however, draw water at such hours of the day that it does not interfere with the normal use for which the hand pumps and wells are intended. He will also be responsible for all damage and abnormal repairs arising out of his use, the cost of which shall be recoverable from him. The Engineer-in-Charge shall be the final authority to determine the cost recoverable from the contractor on this account and his decision shall be binding on the contractor.
- (ii) The contractor shall be allowed to construct temporary wells in Government land for taking water for construction purposes only after he has got permission of the Engineer-in-Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work.

**CLAUSE 33****RETURN OF SURPLUS MATERIALS**

Notwithstanding anything contained to the contrary in this contract, where any materials for the execution of the contract are procured with the assistance of Government either by issue from Government stocks or purchase made under orders or permits or licences issued by Government, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of the Government and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of the terms of the licence or permit and/or for criminal breach of trust, be liable to Government for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

**CLAUSE 34****HIRE OF PLANT & MACHINERY**

- (i) The contractor shall arrange at his own expense all tools, plant, machinery and equipment (hereinafter referred to as T&P) required for execution of the work except for the Plant & Machinery listed in Schedule 'C' and stipulated for issue to the contractor. If the contractor requires any item of T&P on hire from the T&P available with the Government over and above the T&P stipulated for issue, the Government will, if such item is available, hire it to the contractor at rates to be agreed upon between him and the Engineer-in-Charge. In such a case, all the conditions hereunder for issue of T&P shall also be applicable to such T&P as is agreed to be issued.
- (ii) Plant and Machinery when supplied on hire charges shown in Schedule 'C' shall be made over and taken back at the departmental equipment yard/shed shown in Schedule 'C' and the contractor shall bear the cost of carriage from the place of issue to the site of work and back. The contractor shall be responsible to return the plant and machinery with condition in which it was handed over to him, and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Engineer-in-Charge shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.
- (iii) The plant and machinery as stipulated above will be issued as and when available and if required by the contractor. The contractor shall arrange his programme of

work according to the availability of the plant and machinery and no claim, whatsoever, will be entertained from him for any delay in supply by the Department.

- (iv) The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery made over upto and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to no fault of the contractor or faulty use requiring more than three working days continuously (excluding intervening holidays and Sundays) for bringing the plant in order. The contractor shall immediately intimate in writing to the Engineer-in-Charge when any plant or machinery gets out of order requiring major repairs as aforesaid. The Engineer-in-Charge shall record the date and time of receipt of such intimation in the log sheet of the plant or machinery. Based on this if the breakdown before lunch period or major breakdown will be computed considering half a day's breakdown on the day of complaint. If the breakdown occurs in the post lunch period of major breakdown will be computed starting from the next working day. In case of any dispute under this clause, the decision of the Engineer-in-Charge shall be final and binding on the contractor.
- (v) The hire charges shown above are for each day of 8 hours (inclusive of the one hour lunch break) or part thereof.
- (vi) Hire charges will include service of operating staff as required and also supply of lubricating oil and stores for cleaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the contractor who shall be fully responsible for the safeguard and security of plant and machinery. The contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the Department against any loss or damage caused to the plant and machinery either during transit or at site of work.
- (vii) Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer-in-Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period of 8 hours a day. In that case, the hourly hire charges for overtime to be borne by the contractor shall be 50% more than the normal proportionate hourly charges (1/8th of the daily charges) subject to a minimum of half day's normal charges on any particular day. For working out hire charges for over time, a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored.
- (viii) The contractor shall release the plant and machinery every seventh day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the contractor for the day of servicing/ wash out irrespective of the period employed in servicing.
- (ix) The plant and machinery once issued to the contractor shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer-in-Charge, the work or a portion of work for which the same was issued is completed.

- (x) Log Book for recording the hours of daily work for each of the plant and machinery supplied to the contractor will be maintained by the Department and will be countersigned by the contractor or his authorized agent daily. In case the contractor contests the correctness of the entries and/or fails to sign the Log Book, the decision of the Engineer-in-Charge shall be final and binding on him. Hire charges will be calculated according to the entries in the Log Book and will be binding on the contractor. Recovery on account of hire charges for road rollers shall be made for the minimum number of days worked out on the assumption that a roller can consolidate per day and maximum quantity of materials or area surfacing as noted against each in the annexed statement (see attached annexure).
- (xi) In the case of concrete mixers, the contractors shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion.
- (a) In case rollers for consolidation are employed by the contractor himself, log book for such rollers shall be maintained in the same manner as is done in case of departmental rollers, maximum quantity of any items to be consolidated for each roller-day shall also be same as in Annexure to Clause 34(x). For less use of rollers, recovery for the less roller days shall be made at the stipulated issue rate.
- (xii) The contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Engineer-in-Charge shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.
- (xiii) In the event of the contractor not requiring any item of plant and machinery issued by Government though not stipulated for issue in Schedule 'C' any time after taking delivery at the place of issue, he may return it after two days written notice or at any time without notice if he agrees to pay hire charges for two additional days without, in any way, affecting the right of the Engineer-in-Charge to use the said plant and machinery during the said period of two days as he likes including hiring out to a third party.

## **CLAUSE 35**

### **CONDITION RELATING TO USE OF ASPHALTIC MATERIALS**

- (i) The contractor undertakes to make arrangement for the supervision of the work by the firm supplying the tar or bitumen used.
- (ii) The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting is started and shall hypothecate it to the Engineer-in-Charge. If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made and the material

return to the contractors. Although the materials are hypothecated to Government, the contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in- Charge in writing.

- (iii) The contractor shall be responsible for rectifying defects noticed within a year from the date of completion of the work and the portion of the security deposit relating to asphaltic work shall be refunded after the expiry of this period.

## **CLAUSE 36**

### **EMPLOYMENT OF TECHNICAL STAFF AND EMPLOYEES**

#### **Contractors Superintendence, Supervision, Technical Staff & Employees**

- (i) The contractor shall provide all necessary superintendence during execution of the work and all along thereafter as may be necessary for proper fulfilling of the obligations under the contract.

The contractor shall immediately after receiving letter of acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge, the name(s), qualifications, experience, age, address(s) and other particulars along with certificates, of the principal technical representative to be in charge of the work and other technical representative(s) who will be supervising the work. Minimum requirement of such technical representative(s) and their qualifications and experience shall not be lower than specified in Schedule 'F'. The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative(s) to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal, the contractor shall appoint another such representative(s) according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal technical representative and other technical representative(s) shall be appointed by the contractor soon after receipt of the approval from Engineer-in-charge and shall be available at site before start of work.

All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s) The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Engineer-in-Charge and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in- Charge or his designated representative(s) in the site order book and shall affix his/their signature in token of noting down the instructions and in token of acceptance of measurements/ checked measurements/test checked

measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.

If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is/are effectively appointed or is/are effectively attending or fulfilling the provision of this clause, a recovery (non-refundable) shall be effected from the contractor as specified in Schedule 'F' and the decision of the Engineer-in-Charge as recorded in the site order book and measurement recorded checked/test checked in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable Principal technical representative and/or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) alongwith every on account bill/ final bill and shall produce evidence if at any time so required by the Engineer-in-Charge. The contractor shall submit a certificate of employment of the technical representative(s) (in the form of copy of Form-16 or CPF deduction issued to the Engineers employed by him) along with every on account bill/final bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

- (ii) The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work.

The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent substitutes.

## **CLAUSE 37**

### **LEVY/TAXES PAYABLE BY CONTRACTOR**

- (i) GST, Building and other Construction Workers Welfare Cess or any other tax, levy or Cess in respect of input for or output by this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect except as provided under Clause 38.
- (ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities.

- (iii) If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the Government of India and does not any time become payable by the contractor to the State Government, Local authorities in respect of any material used by the contractor in the works, then in such a case, it shall be lawful to the Government of India and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor.

### **CLAUSE 38**

#### **CONDITIONS FOR REIMBURSEMENT OF LEVY/TAXES IF LEVIED AFTER RECEIPT OF TENDERS**

- (i) All tendered rates shall be inclusive of any tax, levy or cess applicable on last stipulated date of receipt of tender including extension if any. No adjustment, i.e., increase or decrease shall be made for any variation in the rate of GST, Building and Other Construction Workers Welfare Cess or any tax, levy or cess applicable on inputs.

However, effect of variation in rates of GST or Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either side, increase or decrease.

Provided further that for Building and Other Construction Workers Welfare Cess or any tax (other than GST), levy or cess varied or imposed after the last date of receipt of tender including extension if any, any increase shall be reimbursed to the Contractor only if the Contractor necessarily and properly pays such increased amount of taxes/levies/cess.

Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined by authority for extension of time under Clause 5 of Schedule F.

- (ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Government and/or the Engineer-in-Charge and shall also furnish such other information/document as the Engineer-in-Charge may require from time to time.
- (iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

**CLAUSE 39****TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR**

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the authority indicated in schedule "F" on behalf of the *Executing Agency* shall have the option of terminating the contract without compensation to the contractor.

**CLAUSE 40****IF RELATIVE WORKING IN OFFICE OF CLIENT/DEPARTMENT THEN THE CONTRACTOR NOT ALLOWED TO TENDER**

The contractor shall not be permitted to tender for works in the Client /Department (Responsible for award and execution of contracts) in which his near relative is posted as Divisional Accountant or equivalent or as an officer in any capacity between the grades of the General Manager/ Chief Engineer and Site Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted Officer in the in the Ministry of Health & Family Welfare. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department. If however the contractor is registered in any other department, he shall be debarred from tendering in the Department in future for any breach of this condition.

NOTE: By the term "near relatives" is meant wife, husband, parents and grandparents, children and grandchildren, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.

**CLAUSE 41****NO GAZETTED ENGINEER TO WORK AS CONTRACTOR WITHIN ONE YEAR OF RETIREMENT**

No engineer of gazetted rank or other gazetted officer employed in engineering or administrative duties in an engineering department of the Government of India shall work as a contractor or employee of a contractor for a period of one year after his retirement from government service without the previous permission of Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of Government of India as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.

**CLAUSE 42****RETURN OF MATERIAL & RECOVERY FOR EXCESS MATERIAL USED**

- (i) After completion of the work and also at any intermediate stage in the event of non-reconciliation of materials issued, consumed and in balance - (see Clause 10), theoretical quantity of materials issued by the Government for use in the work shall be calculated on the basis and method given hereunder:-
  - (a) Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required for different items of work as shown in the



Schedule of Rates mentioned in Schedule 'F'. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer-in-Charge.

- (b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer-in-Charge, including authorized lappages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately.
  - (c) Theoretical quantity of G.I. & C.I. or other pipes, conduits, wires and cables, pig lead and G.I./M.S. sheets shall be taken as quantity actually required and measured plus 5% for wastage due to cutting into pieces (except in the case of G.I./M.S. sheets it shall be 10%), such determination & comparison being made diameter wise & category wise.
  - (d) For any other material as per actual requirements.
- (ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Schedule 'F'. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorized variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Engineer-in-Charge within fifteen days of the issue of written notice by the Engineer-in-charge to this effect shall be recovered at the rates specified in Schedule 'F', without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer-in-Charge in regard to theoretical quantities of materials, which should have been actually used as per the Annexure of the standard schedule of rates and recovery at rates specified in Schedule 'F', shall be final & binding on the contractor. For non-scheduled items, the decision of the Engineer-in-Charge regarding theoretical quantities of materials which should have been actually used, shall be final and binding on the contractor.
- (iii) The said action under this clause is without prejudice to the right of the Government to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.

## **CLAUSE 43**

### **COMPENSATION DURING WARLIKE SITUATIONS**

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged

work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for reconstruction of all works ordered by the Engineer-in-Charge, such payments being in addition to compensation upto the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Engineer-in-charge or his authorized representative. The contractor shall be paid for the damages/destruction suffered and for restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

Provided always that no compensation shall be payable for any loss in consequence of hostilities or warlike operations (a) unless the contractor had taken all such precautions against air raid as are deemed necessary by the A.R.P. Officers or the Engineer-in-Charge (b) for any material etc. not on the site of the work or for any tools, plant, machinery, scaffolding, temporary building and other things not intended for the work.

In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the Engineer-in-charge.

#### **CLAUSE 44**

##### **APPRENTICES ACT PROVISIONS TO BE COMPLIED WITH**

The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Client may, in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

#### **CLAUSE 45**

##### **RELEASE OF SECURITY DEPOSIT AFTER LABOUR CLEARANCE**

Deposit of the work shall not be refunded till the contractor produces a clearance deposit after labour certificate from the Labour Officer. As soon as the work is virtually complete the contractor clearance shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

### **SECTION-3**

#### **SAFETY CODE**

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than  $\frac{1}{4}$  to 1 ( $\frac{1}{4}$  horizontal and 1 vertical).
2. Scaffolding of staging more than 3.6 m (12 ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured atleast 90 cm (3 ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
3. Working Platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12 ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.
4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm (3 ft.).
5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m (30 ft) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11  $\frac{1}{2}$ " ) for ladder upto and including 3 metre (10 ft.) in length. For longer ladders this width should be increased atleast  $\frac{1}{4}$ " for each additional 30 cm.(1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which maybe awarded in any such suit, action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.
6. (a) Excavation and trenching- All trenches 1.2 m (4 ft,) or more in depth, shall at all times be supplied with at least one ladder for each 30 metre (100 ft) in length or fraction thereof. Ladder shall extend from bottom of the trench to at least 90 cm. (3 ft) above the surface of the ground. The sides of the trenches, which are 1.5 m (5 ft) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated material shall not be placed within 1.5 m (5 ft) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
6. (b) Safety Measures for digging bore holes:-
  - (i) If the bore well is successful, it should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned ones should be

- completely refilled to avoid caving and collapse;
- (ii) During drilling, Sign boards should be erected near the site with the address of the drilling contractor and the Engineer in-charge of the work;
  - (iii) Suitable-fencing should be erected around the well during the drilling and after the installation of the rig on the point of drilling, flags shall be put 50m around the point of drilling to avoid entry of people;
  - (iv) After drilling the borewell, a cement platform (0.50m x 0.50m to 1.20m) 0.60m above ground level and 0.60m below ground level should be constructed around the well casing;
  - (v) After the completion of the borewell, the contractor should cap the bore well properly by welding steel plate, cover the bore well with the drilled wet soil and fix thorny shrubs over the soil. This should be done even while repairing the pump;
  - (vi) After the borewell is drilled the entire site should be brought to the ground level.
7. Demolition. - Before any demolition work is commenced and also during the progress of the work,
- i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
  - ii) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.
  - iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.
8. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned. The following safety equipment shall invariably be provided.
- i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
  - ii) Those engaged in whitewashing and mixing or stacking of cement bags or any material, which is injurious to the eyes, shall be provided with protective goggles.
  - iii) Those engaged in welding works shall be provided with welder's protective eye shields.
  - iv) Stonebreakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
  - v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and ventilated atleast for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition , the contractor shall ensure that the following safety measures are adhered to:-
    - a) Entry for workers into the line shall not be allowed except under supervision of the Engineer in Charge or any other higher officer.
    - b) At least 5 to 6 manholes upstream and downstream should be kept open for atleast 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

- c) Before entry presence of toxic gases should be tested by inserting wet lead acetate paper, which changes colour in the presence of such gases and gives indication of their presence.
- d) Presence of oxygen should be verified by lowering a detector lamp into the manhole. In case, no oxygen is found inside the sewer line, worker should be sent only with oxygen kit.
- e) Safety belt with rope should be provided to the workers. While working inside the manhole such rope should be handled by two men standing outside to enable him to be pulled out during emergency.
- f) The area should be barricaded or cordoned off by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever for the cleaning works are undertaken during night or day.
- g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.
- h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.
- i) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge may decide the time upto which worker may be allowed to work continuously inside the manhole.
- j) Gas masks with Oxygen cylinder should be kept at site for use in emergency.
- k) Air blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air blowers are recommended for ventilating the manholes. The motors for these, shall be vapour proof and of totally enclosed type. Non-sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side, protected from wind so that they will not be the source of friction on any inflammable gas that might be present.
- l) The workers engaged for cleaning the manholes/sewers should be properly trained before allowing working in the manhole.
- m) The worker shall be provided with Gumboots or non-sparking shoes bump helmets and gloves non-sparking tools and safety lights and gas masks and portable air-blowers (when necessary). They must be supplied with barrier cream for anointing the limits before working inside the sewer lines.
- n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.
- o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.
- p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.
- vi) The contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Whenever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken: -
  - a) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

- Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scrapped.
- b) Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.
9. As per additional clause (viii)(i) of Government Safety Code(iv), the Contractor shall not employ women and men below the age of 18 years on the work of painting with product containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use:
- i) White lead, sulphate of lead or product containing these pigments, shall not be used in painting operation except in the form of pastes or paint ready for use.
  - ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of paint in the form of spray.
  - iii) Measures shall be taken, wherever practicable to prevent danger arising out of from dust caused by dry rubbing down and scrapping.
  - iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work
  - v) Overall shall be worn by working painters during the whole of working period.
  - vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.
  - vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by the competent authority of Department.
  - viii) Department may require, when necessary, medical examination of workers.
  - ix) Instructions with regard to special hygienic precautions, to be taken in the painting trade, shall be distributed to working painters.
10. When the work is done near any place where there is risk of drowning, all necessary equipment should be provided & kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.
11. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions: -
- (i) (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.
  - (b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength, and free from patent defects.
  - (ii) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.
  - (iii) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley blocks used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to

above shall be plainly marked with the safe working load. In case of hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear, referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(iv) In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-in-Charge. As regard contractor's machines the contractors shall notify the safe working load of the machines to the Engineer-in-Charge whenever he brings any machinery to the site of work and get it verified by the Electrical Engineer concerned.

12. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energised, insulating mats, wearing apparel, such as gloves, sleeves and boots, as may be necessary, should be provided. The worker should not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.
13. All scaffolds ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.
14. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.
15. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by Labour Officer or the Engineer-in-Charge or their representatives.
16. Notwithstanding the above clauses from (1) to (15) there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

## **Section -4**

### **RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS**

#### **1. APPLICATION**

These rules shall apply to all buildings and construction works in charge of the Client in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

#### **2. DEFINITION**

**Work place** means a place where twenty or more workers are ordinarily employed in connection with construction work, on any day during the period, during which the contract work is in progress.

#### **3. FIRST-AID FACILITIES**

- i) At every work place there shall be provided and maintained, so as to be easily accessible during working hours, first aid boxes at the rate of not less than one box for 150-contract labour or part thereof ordinarily employed.
- ii) The first-aid box shall be distinctly marked with a red cross on white background and shall contain the following equipment: -
  - a) For work places in which the number of contract labour employed does not exceed 50- Each first-aid box shall contain the following equipment: -
    1. 6 small sterilised dressings.
    2. 3 medium size sterilised dressings.
    3. 3 large size sterilised dressings.
    4. 3 large sterilised burn dressings.
    5. 1 (30 ml.) bottle containing a two percent alcoholic solution of iodine
    6. 1 (30ml) bottle containing salvolatile having the dose and mode of administration indicated on the label.
    7. 1 snakebite lancet.
    8. 1 (30gms.) bottle of potassium permanganate crystals.
    9. 1 pair scissors.
    10. 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institute, Government of India or his Client.
    11. 1 Bottle containing 100 tablets (each of 5 gms.) of aspirin.
    12. Ointment for burns.
    13. A bottle of suitable surgical antiseptic solution
  - b) For workplaces in which the number of contract labour exceeds 50- Each first-aid- box shall contain the following equipment.
    1. 12 small sterilized dressing.



2. 6 medium size sterilised dressings.
  3. 6 large size sterilised dressings.
  4. 6 large size sterilised burn dressings.
  5. 6 (15-gms.) packets sterilised cotton wool.
  6. 1 (60 ml.) bottle containing two percent alcoholic solution iodine.
  7. 1 (60-ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
  8. 1 roll of adhesive plaster.
  9. 1 snake bite lancet.
  10. 1 (30 gms.) bottle of potassium permanganate crystals.
  11. 1 pair of scissors.
  12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institute/ Government of India or Client of India.
  13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
  14. Ointment for burns.
  15. A bottle of suitable surgical antiseptic solution.
- iii) Adequate arrangements shall be made for immediate procurement of the equipment when necessary.
- iv) Nothing except the prescribed contents shall be kept in the First-aid box.
- v) The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours at the work place.
- vi) A person in charge of the first-aid box shall be a person trained in First-Aid treatment, at the work places where the number of contract labour employed is 150 or more.
- vii) In work places where the number of contract labour employed is 500 or more and hospital facilities are not available within easy distance from the works, First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.
- viii) Where work places are situated in places, which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

#### 4. DRINKING WATER

- i) In every work place, there shall be provided and maintained, at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.
- ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

- iii) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well, which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it or for drinking. All such wells shall be entirely closed in and be provided with a trap door, which shall be dust and waterproof.
- iv) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

## 5. WASHING FACILITIES

- i) In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.
- ii) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.
- iii) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

## 6. LATRINES AND URINALS

- i) Latrines shall be provided in every work place on the following scale namely:-
  - a) Where female are employed there shall be at least one latrine for every 25 females.
  - b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be upto the first 100, and one for every 50 thereafter.
- ii) Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.
- iii) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials and shall be cement washed inside and outside at least once a year. Latrines shall not be of a standard lower than bore-hole system.
- iv)
  - a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women only" as the case may be.
  - b) The notice shall also bear the figure of a man or a woman, as the case may be.
- v) There shall be at least one urinal for upto 50 number of male workers and one for upto 50 number of female workers employed at a time, provided that where the number of male or female workers, as the case may be, exceeds

- 500, it shall be sufficient if there is one urinal for every 50 males or females, upto the first 500 and one for every 100 or part thereafter.
- vi) a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
    - b) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.
  - vii) Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.
  - viii) Disposal of excreta: - Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight (When it will turn to manure).
  - ix) The contractor shall at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges, which may be levied by Municipal or Cantonment Authority for execution of such on his behalf.

## 7. PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 metres (10 ft.) from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq. m. (6 sq. ft.) per head.

Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

## 8. CRECHES

- i) At every work place, at which 20 or more women worker are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a playroom for the children and the other as their bedroom. The rooms shall be constructed with specifications as per clause 19 H (ii) a, b & c.
- ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.
- iii) The contractor shall supply adequate number of toys and games in the playroom and sufficient number of cots and beddings in the bedroom.
- iv) The contractor shall provide one ayah to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceeds 50.

- v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

## 9. CANTEENS

- i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.
- ii) The contractor shall maintain the canteen in an efficient manner.
- iii) The canteen shall consist of atleast a dining hall, kitchen, storeroom, pantry and washing places, separately for workers and utensils.
- iv) The canteen shall be sufficiently lighted at all times when any person has access to it.
- v) The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colour washed atleast once in each year. Provided that the inside walls of the kitchen shall be lime-washed every 4 months.
- vi) The premises of the canteen shall be maintained in a clean and sanitary condition.
- vii) Wastewater shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.
- viii) Suitable arrangements shall be made for the collection and disposal of garbage.
- ix) The dining hall shall accommodate at a time 30 percent of the contract labour working at a time.
- x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture, except tables and chairs, shall not be less than one square metre (10 sft.) per diner to be accommodated as prescribed in sub-Rule 9.
- xi)
  - a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.
  - b) Washing places for women shall be separate and screened to secure privacy.
- xii) Sufficient tables' stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.
- xiii)
  - a)
    - 1. There shall be provided and maintained, sufficient utensils, crockery, furniture and any other equipment's, necessary for the efficient running of the canteen.
    - 2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.
  - b)
    - 1. Suitable clean cloths for the employees serving in the canteen shall be provided and maintained.
    - 2. A service counter, if provided, shall have top of smooth and impervious material.

3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment's.
- xiv) The foodstuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.
  - xv) The charges for foodstuffs, beverages and any other items served in the canteen shall be based on 'No profit, No loss' and shall be conspicuously displayed in the canteen.
  - xvi) In arriving at the price of food stuffs, and other articles served in the canteen, the following items shall not be taken into consideration as expenditure namely: -
    - a) The rent of land and building.
    - b) The depreciation and maintenance charge for the building and equipment's provided for the canteen.
    - c) The cost of purchase, repairs and replacement of equipment's including furniture, crockery, cutlery and utensils.
    - d) The water charges and other charges incurred for lighting and ventilation.
    - e) The interest and amounts spent on the provision and maintenance of equipment's provided for the canteen.
  - xvii) The accounts pertaining to the canteen shall be audited once every 12 months by Registered accountants and auditors.

**10. ANTI-MALARIAL PRECAUTIONS**

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling-up of any borrow pits which may have been dug by him.

- 11.** The above rules shall be incorporated in the contracts and in notices inviting tenders and shall form an integral part of the contracts.

**12. AMENDMENTS**

Department may, from time to time, add to or amend these rules and issue directions it may consider necessary for the purpose of removing any difficulty, which may arise in the administration thereof.

## **SECTION-5**

### **CPWD CONTRACTOR'S LABOUR REGULATIONS TO BE FOLLOWED IN THIS PROJECT**

#### **1. SHORT TITLE**

These regulations may be called the CPWD Contractors Labour Regulations and shall be followed by the Contractor for this Project.

#### **2. DEFINITIONS**

i) **Workman** means, any person employed by Department or its contractor directly or indirectly, through a subcontractor, with or without the knowledge of the Department, to do any skilled, semiskilled or unskilled, manual, supervisory, technical or clerical work, for hire or reward, whether the terms of employment are expressed or implied, but does not include any person: -

a) Who is employed mainly in a managerial or administrative capacity; or,

b) Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercises either by the nature of the duties attached to the office or by reason of powers vested in him, functions mainly of managerial nature; or,

c) Who is an out worker, that is to say, person to whom any article or materials are given out by or on behalf of the principal employers to be made up cleaned, washed, altered, ornamental finished, repaired adopted or otherwise processed for sale for the purpose of the trade or business of the principal employers and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal employer.

No person below the of 14 years shall be employed to act as a workman

ii) **Fair Wages** means wages whether for time or piecework fixed and notified under the provision of the Minimum Wages Act from time to time.

iii) **Contractors** shall include every person who undertakes to produce a given result other than a mere supply of goods or articles of manufacture through contract labour or who supplies contract labour for any work and includes a subcontractor.

iv) **Wages** shall have the same meaning as defined in the Payment of Wages Act.

#### **3.**

i) Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

- ii) When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week he shall be paid over time for the extra hours put in by him at double the ordinary rate of wages.
- iii) a) Every worker shall be given a weekly holiday normally on a Sunday, in accordance with the provisions of Minimum Wages (Central) Rules 1960, as amended from time to time, irrespective of whether such worker is governed by the Minimum Wages Act or not.
  - b) Where the minimum wages prescribed by the Government, under the Minimum Wages Act, are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages, at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.
- c) Where a contractor is permitted by the Engineer-in-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substituted holiday to him for the whole day, on one of the five days, immediately before or after the normal weekly holiday, and pay wages to such worker for the work performed on the normal weekly holiday at the overtime rate.

#### **4. DISPLAY OF NOTICE REGARDING WAGES ETC.**

The contractor shall, before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain, in a clear and legible condition in conspicuous places on the work, notices in English and in local Indian languages spoken by the majority of the workers, giving the minimum rates of the wages fixed under Minimum Wages Act, the actual wages being paid, the hours of work for which such wage are earned, wages periods, dates of payments of wages and other relevant information as per Appendix 'III'.

#### **5. PAYMENT OF WAGES.**

- i) The contractor shall fix wage periods in respect of which wages shall be payable.
- ii) No wage period shall exceed one month.
- iii) The wages of every person employed as contract labour in an establishment or by a contractor, where less than one thousand such persons are employed, shall be paid before the expiry of seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.
- iv) Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.
- v) All payment of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

- vi) Wages due to every worker shall be paid to him direct or to other person authorised by him in this behalf.
- vii) All wages shall be paid in current coin or currency or in both.
- viii) Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.
- ix) A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgement.
- x) It shall be the duty of the contractor to ensure the disbursement of wages in presence of authorised representative of the Engineer-in-Charge who will be required to be present at the place and time of the disbursement of wages by the contractor to workmen.
- xi) The contractor shall obtain from the junior engineer or any other authorised representative of the Engineer-in-Charge, as the case may be, a certificate under his signature at the end of the entries in the "Register of Wages" or the "Wage-cum-Muster Roll", as the case may be, in the following form: -  
"Certified that the amount shown in the column No.....has been paid to the workman concerned in my presence on.....at....."

## 6. FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES

- (i) The wages of a worker shall be paid to him without any deduction of any kind except the following: -
  - (a) Fines
  - (b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.
  - (c) Deductions for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deductions which he is required to account, where such damage or loss is directly attributable to his neglect or default.
  - (d) Deduction for recovery of advances or for adjustment of overpayment of wages, advances granted shall be entered in a register.
  - (e) Any other deduction, which the Central Government may from time to time, allows.
- (ii) No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Chief Labour Commissioner.

**Note:-** An approved list of Acts and Omission for which fines can be imposed is enclosed at Appendix-1.



- (iii) No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.
- (iv) The total amount of fine, which may be imposed, in any one-wage period, on a worker, shall not exceed an amount equal to three paise in a rupee of the total wages, payable to him in respect of that wage period.
- (v) No fine imposed on any worker shall be recovered from him by instalment, or after the expiry of sixty days from the date on which it was imposed.
- (vi) Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

## 7. LABOUR RECORDS

- (i) The contractor shall maintain a **Register of Persons employed** on work on contract in Form XIII of the CL (R&A) Central Rules 1971 (Appendix IV)
- (ii) The contractor shall maintain a **Muster Roll** register in respect of all workmen employed by him on the work under Contract in Form XVI of the CL (R&A) Rules 1971 (Appendix V)
- (iii) The contractor shall maintain a **Wage Register** in respect of all workmen employed by him on the work under contract in Form XVII of the CL (R&A) Rules 1971 (Appendix VI)
- (iv) **Register of accident** - The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:
  - a) Full Particulars of the labourers who met with accident.
  - b) Rate of wages.
  - c) sex
  - d) Age
  - e) Nature of accident and cause of accident
  - f) Time and date of accident
  - g) Date and time when admitted in hospital
  - h) Date of discharge from the hospital
  - i) Period of treatment and result of treatment
  - j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
  - k) Claim required to be paid under Workmen's Compensation Act.
  - l) Date of payment of compensation
  - m) Amount paid with details of the person to whom the same was paid
  - n) Authority by whom the compensation was assessed

o) Remarks.

v) The contractor shall maintain a **Register of Fines** in the Form XII of the CL (R&A) Rules 1971 (Appendix XI)

The contractor shall display in a good condition and in a conspicuous place of work the approved list of acts and omission for which fines can be imposed (Appendix X)

vi) The contractor shall maintain a **Register of deductions for damage or loss** in Form XX of the CL (R&A) Rules 1971 (Appendix XII).

vii) The contractor shall maintain a **Register of Advances** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIII).

viii) The contractor shall maintain a **Register of Overtime** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIV).

## 8. ATTENDANCE CARD-CUM WAGE SLIP

i) The contractor shall issue an **Attendance card cum wage slip** to each workman employed by him in the specimen form at (Appendix-VII).

ii) The card shall be valid for each wage period.

iii) The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

iv) The card shall remain in possession of the worker during the wage period under reference.

v) The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

vi) The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with him.

## 9. EMPLOYMENT CARD

The contractor shall issue an **Employment Card** in the Form XIV of CL (R&A) Central Rules 1971 to each worker within three days of the employment of the worker (Appendix-VIII).

## 10. SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a Service Certificate in the Form XV of the CL (R&A) Central Rules 1971 (Appendix-IX).

## 11. PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulations Nos. 6 & 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-in-Charge or Labour Officer or any other officers authorised by the Department this behalf.

## **12. POWER OF LABOUR OFFICER TO MAKE INVESTIGATIONS OR ENQUIRY**

The labour officer or any person authorised by the Central Government on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of Fair Wage Clauses and provisions of these Regulations. He shall investigate into any complaint regarding the default made by the contractor or subcontractor in regard to such provision.

## **13. REPORT OF LABOUR OFFICER**

The Labour Officer or other persons authorised as aforesaid shall submit a report of result of his investigation or enquiry to the Engineer in charge concerned indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned. In case an appeal is made by the contractor under Clause 13 of these regulations, actual payment to labourers will be made by the Engineer in charge after the *designated authority of the Executing Agency* has given his decision on such appeal.

- i) Engineer in charge shall arrange payments to the labour concerned within 45 days from the receipt of the report form or the *designated authority of the Executing Agency* as the case may be the Labour Officer

## **14. APPEAL AGAINST THE DECISION OF LABOUR OFFICER**

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorised may appeal against such decision to the *designated authority of the Executing Agency* concerned within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Executive Engineer concerned but subject to such appeal, the decision of the officer shall be final and binding upon the contractor.

## **15. PROHIBITION REGARDING REPRESENTATION THROUGH LAWYER**

- i) A workman shall be entitled to be represented in any investigation or enquiry under these regulations by: -
  - a) An officer of a registered trade union of which he is a member.
  - b) An officer of a federation of trade unions to which the trade union referred to in Clause (a) is affiliated.
  - c) Where the employer is not a member of any registered trade union, by an officer of a registered trade union, connected with the industry in which the

worker is employed or by any other workman employed in the industry in which the worker is employed.

- ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by:-
  - a) An officer of an association of employers of which he is a member.
  - b) An officer of a federation of associations of employers to which association referred to in Clause (a) is affiliated.
  - c) Where the employer is not a member of any association of employers, by an officer of association of employer connected with the industry, in which the employer is engaged or by any other employer, engaged in the industry in which the employer is engaged.
- iii) No party shall be entitled to be represented by a legal practitioner in any investigation inquiry under these regulations.

#### **16. INSPECTION OF BOOKS AND SLIPS**

The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Officer or any other person, authorised by the Central Government on his behalf.

#### **17. SUBMISSION OF RETURNS**

The contractor shall submit periodical returns as may be specified from time to time.

#### **18. AMENDMENTS**

The Central Government may from time to time add to or amend the regulations and on any question as to the application/interpretation or effect of those regulations the decision of the EIC concerned shall be final.

## Appendix 'I'

### REGISTER OF MATERNITY BENEFITS (Clause 19F)

Name and address of the contractor\_\_\_\_\_

Name and Location of the work\_\_\_\_\_

| Name of the Employee | Father's/husband's name | Nature of Employment | Period of actual confinement | Date on which notice of confinement given |
|----------------------|-------------------------|----------------------|------------------------------|---|
| 1                    | 2                       | 3                    | 4                            | 5   |
|                      |                         |                      |                              |   |

| Date on which maternity leave commenced and ended |                     |       |                        |       |
|---|---------------------|-------|------------------------|-------|
| Date of Delivery/<br>Miscarriage                  | In case of delivery |       | In case of miscarriage |       |
|   | Commenced           | Ended | Commenced              | Ended |
| 6   | 7                   | 8     | 9                      | 10    |
|   |                     |       |                        |       |

| Leave pay paid to the employee |             |                        |             | Remarks |
|--------------------------------|-------------|------------------------|-------------|---------|
| In case of delivery            |             | In case of miscarriage |             |         |
| Rate of leave pay              | Amount paid | Rate of leave pay      | Amount paid |         |
| 11                             | 12          | 13                     | 14          | 15      |
|                                |             |                        |             |         |

**Appendix 'II'****SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT ADMISSIBLE TO THE CONTRACTOR'S LABOUR**

Name and address of the contractor\_\_\_\_\_

Name and location of the work\_\_\_\_\_

1. Name of the woman and her husband's name.
2. Designation
3. Date of appointment.
4. Date with months and years in which she is employed.
5. Date of discharge / dismissal, if any.
6. Date of production of certificates in respect of pregnancy.
7. Date on which the woman informs about the expected delivery.
8. Date of delivery / miscarriage / death.
9. Date of production of certificates in respect of delivery / miscarriage.
10. Date with the amount of maternity/ death benefit paid in advance of expected delivery.
11. Date with amount of subsequent payment of maternity benefit.
12. Name of the person nominated by the woman to receive the payment of the maternity benefit after her death.
13. If the woman dies, the date of death, the name of the person to whom maternity benefit amount was paid, the month thereof and the date of payment.
14. Signature of the contractor authenticating entries in the register.
15. Remarks column for the use of inspecting officer.

**Appendix 'III'****LABOUR BOARD**

Name of work: \_\_\_\_\_

Name of Contractor: \_\_\_\_\_

Address of Contractor: \_\_\_\_\_

Name and address of Government divn. \_\_\_\_\_

Name of CLIENT Labour Officer : \_\_\_\_\_

Address of CLIENT Labour Officer: \_\_\_\_\_

Name of Labour Enforcement Officer: \_\_\_\_\_

Address of Labour Enforcement Officer: \_\_\_\_\_

| Sl.No | Category | Minimum<br>wage<br>Fixed | Actual<br>paid<br>wage | Number<br>Present | Remarks |
|-------|----------|--------------------------|------------------------|-------------------|---------|
|       |          |                          |                        |                   |         |

Weekly holiday \_\_\_\_\_

Wage period \_\_\_\_\_

Date of payment of Wages \_\_\_\_\_

Working hours \_\_\_\_\_

Rest interval \_\_\_\_\_

**Appendix 'IV'**

Form-XIII (See Rule 75)

**Register of Workmen Employed by Contractor**

Name and address of contractor\_\_\_\_\_

Name and address of establishment under which contract is carried on\_\_\_\_\_

Nature and location of Work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

| Sl. No. | Name and surname of Workman | Age and Sex | Father's/<br>Husband's<br>Name | Nature<br>of employment / designation. | Permanent home address of the<br>workman<br>(Village and Tehsil,<br>Taluka and District) | Local Address | Date of commencement<br>of employment | Signature<br>or thumb impression of<br>the workman | Date of<br>Termination<br>of employment. | Reasons<br>For<br>terminations. | Remarks |
|---------|-----------------------------|-------------|--------------------------------|--|--|---------------|---------------------------------------|--|--|---------------------------------|---------|
| 1       | 2                           | 3           | 4                              | 5                                      | 6  | 7             | 8                                     | 9  | 10                                       | 11                              | 12      |
|         |                             |             |                                |  |  |               |                                       |  |  |                                 |         |



**Appendix 'V'**

Form-XVI (See Rule 78(2)(a))

**Muster Roll**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment under which contract is carried on\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

For the month of fortnight\_\_\_\_\_

| Sl. No. | Name of workman | Sex | Father's/ Husband's Name | Dates |   |   |   |   | Remarks |
|---------|-----------------|-----|--------------------------|-------|---|---|---|---|---------|
| 1       | 2               | 3   | 4                        | 5     | 6 | 7 | 8 | 9 | 10      |
|         |                 |     |                          | 1     | 2 | 3 | 4 | 5 |         |
|         |                 |     |                          |       |   |   |   |   |         |

**Appendix 'VI'****Form -XVII (See Rule 78(2)(a))****Register of Wages**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment under which contract is carried on\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

Wages period\_\_\_\_ Monthly/fortnightly

| Sl.No. | Name of workman | Serial No.in the register of workman | Designation of Nature of work done | No. of days worked | Units of work done | Daily rate of wages/piece rate | Basic Wages |
|--------|-----------------|--------------------------------------|------------------------------------|--------------------|--------------------|--------------------------------|-------------|
| 1      | 2               | 3                                    | 4                                  | 5                  | 6                  | 7                              | 8           |
|        |                 |                                      |                                    |                    |                    |                                |             |

| Dearness allowances | Overtime | Other cash payments (Indicate nature) | Total | Deductions if any, (indicate nature) | Nett amount paid | Signature or thumb impression of the workman | Initial of contractor or his representative |
|---------------------|----------|---------------------------------------|-------|--------------------------------------|------------------|--|---|
| 9                   | 10       | 11                                    | 12    | 13                                   | 14               | 15   | 16  |
|                     |          |                                       |       |                                      |                  |  |   |

**Appendix 'VII'**  
**(Observe)**

Wage Card No. \_\_\_\_\_

**Wage Card**

Name and address of the contractor \_\_\_\_\_ Date of issue \_\_\_\_\_

Name and location of work \_\_\_\_\_ Designation \_\_\_\_\_

Name of Workman \_\_\_\_\_ Month/fortnight-----

Rate of Wages \_\_\_\_\_

| DATE    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|         | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Morning |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Evening |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Initial |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

Rate \_\_\_\_\_

Amount \_\_\_\_\_

Received from \_\_\_\_\_ the sum of Rs. \_\_\_\_\_ on account of my wages.

Signature

The wage card is valid for one month from the date of issue

**Appendix 'VII'  
(Reverse)**

Form-XIX  
(See rule 78(2)(b))

**Wages Slip**

Name and address of the contractor\_\_\_\_\_

Name and Father's/Husband's name of workman\_\_\_\_\_

Nature and location of work\_\_\_\_\_

For the Week/Fortnight/Month ending\_\_\_\_\_

1. No. of days worked \_\_\_\_\_
2. No. of units worked in case of piece rate workers\_\_\_\_\_
3. Rate of daily wages/piece rate\_\_\_\_\_
4. Amount of overtime wages\_\_\_\_\_
5. Gross wages payable\_\_\_\_\_
6. Deduction, if any\_\_\_\_\_
7. Net amount of wages paid\_\_\_\_\_

Initials of the Contractors or his representative

**Appendix 'VIII'**

Form-XIV  
(See rule 76)

**Employment Card**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment under which contract is carried on\_\_\_\_\_

Nature of work and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

1. Name of Workman\_\_\_\_\_
2. SI No. in the register of workman employed\_\_\_\_\_
3. Nature of employment/designation\_\_\_\_\_
4. Wage rate (with particulars of unit in case of piece work)\_\_\_\_\_
5. Wages period\_\_\_\_\_
6. Tenure of employment\_\_\_\_\_
7. Remarks\_\_\_\_\_

Signature of contractor

**Appendix 'IX'**

Form-XV (See Rule 77)

**Service Certificate**

Name and address of the contractor\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and Address of workman\_\_\_\_\_

Age or date of birth\_\_\_\_\_

Identification marks\_\_\_\_\_

Father's/Husband's name\_\_\_\_\_

Name and address of establishment in under which contract is carried on\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

| Sl.No. | Total period for which employed |    | Nature of work done | Rate of Wages (with particulars of unit in case of piece work) | Remarks |
|--------|---------------------------------|----|---------------------|--|---------|
|        | From                            | To |                     |  |         |
| 1      | 2                               | 3  | 4                   | 5  | 6       |
|        |                                 |    |                     |  |         |

Signature

**Appendix 'X'****LIST OF ACTS AND OMISSIONS FOR WHICH FINES CAN BE IMPOSED**

In accordance with rule 7 (v) of the CPWD Contractor's Labour Regulations to be displayed prominently at the site of work both in English and local Language.

1. Willful insubordination or disobedience, whether along or in combination with other.
2. Theft fraud or dishonestly in connection with the contractors beside a business or property of Department.
3. Taking or giving bribes or any illegal gratifications.
4. Habitual late attendance.
5. Drunkenness fighting, riotous or disorderly or indifferent behaviour.
6. Habitual negligence.
7. Smoking near or around the area where combustible or other materials are locked.
8. Habitual indiscipline.
9. Causing damage to work in the progress or to property of the Department or of the contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving of false information regarding name, age, father's name etc.
13. Habitual loss of wage cards supplied by the employers.
14. Unauthorized use of employer's property of manufacturing or making of unauthorized particles at the work place.
15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Department and for which the contractors are compelled to undertake rectification.
16. Making false complaints and/or misleading statements.
17. Engaging on trade within the premises of the establishments.
18. Any unauthorized divulgence of business affairs of the employees.
19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimidating any workman or employer during the working hours within the premises.

**Appendix 'XI'**

Form-XII (See Rule 78(2)(d))

**Register of Fines**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment in under which contract is carried on\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

| Sl.No. | Name of workman | Father's/Husband's name | Designation/nature of employment | Act/Omission For which fine imposed | Date of Offence |
|--------|-----------------|-------------------------|----------------------------------|-------------------------------------|-----------------|
| 1      | 2               | 3                       | 4                                | 5                                   | 6               |
|        |                 |                         |                                  |                                     |                 |

| Whether workman Showed cause against fine | Name of person in whose presence employees explanation was heard | Wage period and wages payable | Amount of fine imposed | Date on which fine realized | Remarks. |
|---|--|-------------------------------|------------------------|-----------------------------|----------|
| 7   | 8  | 9                             | 10                     | 11                          | 12       |
|   |  |                               |                        |                             |          |



**Appendix 'XII'**

Form-XX (See Rule 78(2)(d))

**Register of Deduction for Damage or Loss**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment in under which contract is carried on\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

| Sl.No. | Name of workman | Father's/Husband's name | Designation/nature of employment | Particulars of damage or loss | Date of damage or loss |
|--------|-----------------|-------------------------|----------------------------------|-------------------------------|------------------------|
| 1      | 2               | 3                       | 4                                | 5                             | 6                      |
|        |                 |                         |                                  |                               |                        |

| Whether workman showed cause against fine | Name of person in whose presence employees explanation was heard | Amount of deduction imposed | No. of installments | Date of recovery  |                  | Remarks |
|---|--|-----------------------------|---------------------|-------------------|------------------|---------|
|   |  |                             |                     | First installment | Last installment |         |
| 7   | 8  | 9                           | 10                  | 11                | 12               | 13      |
|   |  |                             |                     |                   |                  |         |

**Appendix 'XIII'****Register of Advances**

Name and address of the contractor\_\_\_\_\_

Name and address of establishment in under which contract is carried  
on\_\_\_\_\_

Nature and location of work\_\_\_\_\_

Name and address of Principal Employer\_\_\_\_\_

| Sl. No. | Name of workman | Father's/Husband's name | Designation nature of employment | Wage period and wages payable | Date and Amount of Advance given | Purpose(s) for which Advance made | Number of Installments by which advance to be repaid | Date and amount of each installments repaid | Date on which last Installments was repaid | Remarks |
|---------|-----------------|-------------------------|----------------------------------|-------------------------------|----------------------------------|-----------------------------------|--|---|--|---------|
| 1       | 2               | 3                       | 4                                | 5                             | 6                                | 7                                 | 8  | 9   | 10   | 11      |
|         |                 |                         |                                  |                               |                                  |                                   |  |   |  |         |

**Appendix 'XIV'**

Form-XXIII (See Rule 78(2)(e))

**Register of Overtime**

Name and address of the contractor \_\_\_\_\_

Name and address of establishment in under which contract is carried on  
\_\_\_\_\_

Nature and location of work \_\_\_\_\_

Name and address of Principal Employer \_\_\_\_\_

| Sl.No. | Name of workman | Father's/husband's name | Sex | Designation /nature of employment | Date on which Overtime worked | Total overtime worked or production in case of piece rated | Normal rate of wages | Overtime rate of wages | Overtime earnings | Rate on which overtime wages paid | Remarks |
|--------|-----------------|-------------------------|-----|-----------------------------------|-------------------------------|--|----------------------|------------------------|-------------------|-----------------------------------|---------|
| 1      | 2               | 3                       | 4   | 5                                 | 6                             | 7  | 8                    | 9                      | 10                | 11                                | 12      |
|        |                 |                         |     |                                   |                               |  |                      |                        |                   |                                   |         |

## **Section -6**

### **Formats**

#### **GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER SUPPLY AND SANITARY INSTALLATIONS**

The agreement made this..... Day of ..... Two thousand and ..... between ..... S/O..... (hereinafter called the GUARANTOR of the one part) and the ..... (herein after called the Client of the other part). WHEREAS THIS agreement is supplementary to the contract. (Herein after called the Contract) dated.....and made between the GUARANTOR OF THE ONE PART AND the Client of the other part, whereby the contractor interalia, undertook to render the work in the said contract recited structurally stable workmanship and use of sound materials.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said work will remain structurally stable and guarantee against faulty workmanship, finishing, manufacturing defects of materials and leakages etc.

NOW THE GUARANTOR hereby guarantee that work executed by him will remain structurally stable, after the expiry of maintenance period prescribed in the contract for the minimum life of ten years, to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer- in- charge with regard to nature and cause of defects shall be final.

During the period of guarantee the guarantor shall make good all defects to the satisfaction of the Engineer- in- charge calling upon him to rectify the defects, failing which the work shall be got done by the Client by some other contractor at the guarantor's cost and risk. The decision of the Engineer -in- charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good all the defects, commits breach there-under then the guarantor will indemnify the Principal and his successor against all loss, damage cost expense or otherwise which may be incurred by him by reason of any default on the part of THE GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Client the decision of the Engineer in charge will be final and binding on the parties.

IN WITNESS WHEREOF those presents have been executed by the obligator. And ..... by for and on behalf of the Client on the day, month and year first above written.

Signed sealed and delivery by OBLIGATOR in the presence of:

- 1.
- 2.

SIGNED FOR AND ON BEHALF OF ----- BY..... in the present of:

- 1.
- 2.

**GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR FOR WATER PROOFING TREATMENT FOR BASEMENT/TERRACE/TOILETS.**

The agreement made this \_\_\_\_\_ day of \_\_\_\_\_ two thousand and \_\_\_\_\_ between \_\_\_\_\_ S/o \_\_\_\_\_ (hereinafter called the GUARANTOR of the one part) and the \_\_\_\_\_ (hereinafter called the Client of the other part).

WHEREAS this agreement is supplementary to a contract. (Hereinafter called the Contract) dated \_\_\_\_\_ and made between the GUARANTOR OF THE ONE PART AND the Client of the other part, whereby the contractor interalia, undertook to render the structures in the said contractor of the work in the said contract recited completely water and leak proof.

THE GUARANTOR hereby guarantee that the water proofing treatment given by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the expiry of maintenance period prescribed in the contract. Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects.

The decision of the Engineer in charge with regard to cause of leakage shall be *final*.

During the period of guarantee the guarantor shall make good all defects and in case of any defects being found render the structure water proof to the satisfaction of the Engineer in charge at his cost and shall commence the work for such rectification within seven days from the date of issue of notice from the Engineer in charge calling upon him to rectify the defects, failing which the work shall be got done by the Client through some other contractor at the guarantor's cost and risk. The decision of the *Engineer in charge* as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the water proofing, or commits breach there-under then the guarantor will indemnify the Principal and his successor against all loss, damage, cost of expenses or otherwise which may be incurred by him by reason of any of any default on the part of the GUARANTOR in performance *and observance* of this supplementary agreement.

As to the amount of loss and/or cost incurred by the Client on the decision of the Engineer in charge will be final and binding on the parties.

IN WITNESS WHEREOF those presents have been executed by the obligator \_\_\_\_\_ and by \_\_\_\_\_ by for and on behalf of \_\_\_\_\_ on the day, month and year first above written.

Signed sealed and delivered by OBLIGATOR in presence of:

1. \_\_\_\_\_ 2. \_\_\_\_\_

SIGNED FOR AND ON BEHALF OF \_\_\_\_\_ BY \_\_\_\_\_ In presence of:

1. \_\_\_\_\_ 2. \_\_\_\_\_

Annexure - 3

**SECTION 7****PROFORMA OF SCHEDULES****(Operative Schedules)**

|   |   |   |
|---|---|---|
| <b>SCHEDULE 'A'</b>                                       |   |   |
|   | Schedule of quantities (BOQ)  | Attached as Volume -V, Bill of Quantities.  |
| <b>SCHEDULE 'B'</b>                                       |   |   |
|   | Schedule of materials to be issued to the contractor                    | NIL - No material to be issued to the Contractor  |
| <b>SCHEDULE 'C'</b>                                       |   |   |
|   | Tools and plants to be hired to the contractor                          | NIL - No tools and plants to be hired to the Contractor   |
| <b>SCHEDULE 'D'</b>                                       |   |   |
|   | Extra schedule for specific requirements/document for the work, if any. | As attached in tender form for the work, if any.  |
| <b>SCHEDULE 'E'</b>                                       |   |   |
| Reference to General Conditions of Contract as per Vol-II |   |   |
|   | Name of work : :  | Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (AP) |
|   | Estimated cost of work:   | Rs. 556.99 crores   |
|   | Earnest money:  | Rs. 5.67 crores   |
|   | Performance Guarantee:  | <b>5% of Tendered Value</b>   |
|   | Security Deposit:   | <b>5% of Tendered Value</b>   |

|                                       |  |
|---------------------------------------|--|
| <b>SCHEDULE 'F'</b>                   |  |
| <b>GENERAL RULES &amp; DIRECTIONS</b> |  |
| Officer inviting bid                  | Chief General Manager, HSCC (India) Ltd. |

|                            |  |  |
|----------------------------|--|--|
|                            | Maximum percentage for quantity of items of work to be executed beyond which the rates are to be determined in accordance with Clause 12.2 and 12.3  | Under clause 12 Below  |
| <b>DEFINITIONS</b>         |  |  |
| 1                          | Authority executing the agreement on behalf of the Executing Agency  | Officer nominated by HSCC (India) Ltd.   |
| 2(i)                       | Accepting Authority  | Director (Engineering), HSCC (India) Limited as Executing Agency of Ministry of Health & Family Welfare, Government of India |
| 2(vi)                      | Engineer-in-Charge   | General Manager or any other officer of higher rank nominated by Director (Engineering), HSCC (India) Limited .              |
| 2(ix)                      | Percentage on cost of materials and labour to cover all Overheads and profits.   | 15%  |
| 2(xi)                      | Standard Schedule of Rates   | Delhi Schedule of Rates 2016, with up to date correction slips ( up to date of floating of NIT)                              |
| 2(xii)                     | Department   | <b>HSCC (India) Limited</b>  |
| 9(ii)                      | Standard Contract Form   | All uploaded documents   |
| <b>CLAUSES OF CONTRACT</b> |  |  |
| <b>Clause 1</b>            | (i) Time allowed for submission of Performance Guarantee, Programme Chart (Time & Progress) and applicable labourlicences, registration with EPFO, ESIC & BOCW Welfare Board or proof of applying thereof from the date of issue of letter of acceptance | <b>15 days</b>   |
|                            | (ii) Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period as provided in (i) above.  | <b>15 days</b>   |
| <b>Clause 2</b>            | Authority for fixing compensation under Clause 2.  | Director (Engineering), HSCC (India) Limited   |

|   | Authority for deciding incentive under Clause 2A.   | Applicable                                       |   |
|---|---|--|---|
|   | Whether Clause 2A shall be applicable   | <b>Yes</b>                                       |   |
| <b>Clause 5</b>                                 | Number of days from the date of issue of letter of acceptance for reckoning date of Start           | 15 Days  |   |
|   | Authority to decide shifting of date of start in case of delay in handing over of site.             | Director (Engineering), HSCC (India) Limited     |   |
| Mile stone(s) will be as per table given below: |   |  |   |
| <b>Mile Stone No</b>                            | <b>Description of Milestone (Physical)</b>  | <b>Time allowed in days (from date of start)</b> | <b>Amount to be with- held in case of non - achievement of milestone.</b> |
| 1   | Substantial Completion of Foundation  | 6 months   | 0.25% of Tendered value   |
| 2   | Substantial Completion of RCC works upto Plinth Beam Level  | 9 months   | 0.25% of Tendered value   |
| 3   | Substantial Completion of RCC works upto Floor 3 Level for Hospital Block                           | 11 months  | 0.25% of Tendered value   |
| 4   | Preparation of a sample Toilet  | 12 months  | 0.50% of Tendered value   |
| 5   | Substantial Completion of all RCC works in Super Structure for the buildings of the Academic Campus | 12 months  | 0.25% of Tendered value   |
| 6   | Substantial Completion of Brickwork of the Buildings of Academic Campus                             | 14 months  | 0.25% of Tendered value   |
| 7   | Substantial Completion of all RCC works in Super Structure for the remaining buildings              | 14 months  | 0.25% of Tendered value   |
| 8   | Substantial Completion of Brickwork of the Hospital Block   | 16 months  | 0.25% of Tendered Value   |
| 9   | Substantial Completion of all buildings of the Academic Campus including Finishing and services     | 18 months  | 1% of Tendered value  |



|                     |  |  |                         |
|---------------------|--|--|-------------------------|
| 10                  | Substantial Completion of finishing for all structures   | 21 months  | 1.00% of Tendered value |
| 11                  | Substantial completion of project in all respect including testing and commissioning   | 22 months  | 0.75% of Tendered value |
| <b>Clause 5.4</b>   | Authority for deciding Extension of Time and rescheduling of Milestones  | Director (Engineering), HSCC (India) Limited   |                         |
| <b>Clause 6, 6A</b> | Clause applicable – (6 or 6A)  | <b>6A</b>  |                         |
| <b>Clause 7</b>     | Gross work to be done together with net payment /adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment. | <b>Rs,12.50 Crore</b>  |                         |
| <b>Clause 7A</b>    | Whether clause 7A shall be applicable  | <b>Yes</b>   |                         |
| <b>Clause 8B</b>    | Completion Plans to be Submitted by the Contractor as per specifications   | Latest General CPWD Specifications for Electrical works (Part – I internal) and (Part – II External) |                         |
| <b>Clause 10A</b>   | List of testing equipment to be provided by the contractor at site laboratory.   | <b>As per Annexure-I and II</b>  |                         |
| <b>Clause 10B</b>   | Whether Clause 10 B (ii) shall be applicable   | <b>Yes</b>   |                         |
|                     | Whether Clause 10 B (iii) shall be applicable  | <b>NO</b>  |                         |
| <b>Clause 10C</b>   |  | <b>NOT APPLICABLE . (Only if time of completion is less than 12 month)</b>                           |                         |
|                     | Component of labour expressed as per-cent of value of work   | <b>25%</b>   |                         |
| <b>Clause 10CA</b>  |  | <b>Applicable</b>  |                         |
|                     | Material covered under this clause   | Cement, Steel Reinforcement bars, Structural Steel & POL   |                         |
|                     | Base price of all the materials covered under Clause 10CA (Base price to be mentioned valid at   | *Cement- OPC Rs. 4375/- Tonne, (Excluding GST)   |                         |

|                    |   |  |             |
|--------------------|---|--|-------------|
|                    | the time of last stipulated date of receipt of Tender including extension, if any.  | <b>*Reinforcement Steel-<br/>Primary Manufacturer Rs. 41390/- Tonne<br/>(Excluding GST)</b>  |             |
|                    | * includes cement component used in RMC brought at site from outside approved RMC plants, if any.   |  |             |
|                    | Base price and its corresponding period of all the materials covered under clause 10CA is to be mentioned at the time of approval of NIT.                                   |  |             |
| <b>Clause 10CC</b> | Clause 10 CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column   | <b>Applicable</b> only if time is more than 12 months.   |             |
|                    | Schedule of component of other Materials, Labour POL, etc. for price escalation.  |  |             |
|                    | Component of civil (except materials covered under clause 10CA) and Electrical construction Materials expressed as percentage of total value of work                        | Xm   | <b>40 %</b> |
|                    | Component of Labour – expressed as percent of total value of work.  | Y  | <b>25 %</b> |
|                    | POL   |  | <b>0%</b>   |
|                    | Note:- Xm ..... % should be equal to (100)- Material covered under Clause 10 CA i.e. Cement, Steel, POL and other material specified in Clause 10 CA + component of labour) |  |             |
| <b>Clause 11</b>   | Specifications to be followed for execution of work   | CPWD Specifications with up to date correction slips, (up to date floating of tender) and, Technical Specifications (Volume IV) of the tender documents. |             |
| <b>Clause 12</b>   | Type of Work  | <b>Project and Original Work</b>   |             |
| 12.2 & 12.3        | Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for building work.   | <b>30 %</b>  |             |
| 12.5               | (i) Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for foundation work (Except earth work)  | <b>30%</b>   |             |
|                    | (ii) Deviation Limit for items in earth work subhead of DSR or related items  | <b>100 %</b>   |             |
| <b>Clause 18</b>   | List of mandatory machinery, tools & plants to be deployed at site.   | Are to be suggested by the contractor in Part 1 of NIB   |             |
| <b>Clause 25</b>   | Reviewing Authority   | Chief General Manager, HSCC (India) Limited  |             |

|  |   | Appealing Authority   |   | Director (Engineering), HSCC (India) Limited   |               |   |
|--|---|---|---|--|---------------|---|
|  |   | Constitution of Dispute Redressal Committee   |   | <b>Representative of MOH&amp;FW( Chairman)</b><br>Director (Engineering), HSCC (India) Limited ( Member)<br>Chief General Manager, HSCC (India) Limited( Member) |               |   |
| <b>Clause 36 (i)</b>   |   | <b>Minimum Requirement of Technical Representative(s) and monthly recovery Rate</b> |   |  |               |   |
| S. No.   | Minimum Qualification of Technical Representative | Discipline  | Designation (Principal Technical/ Technical representative) | Minimum Experience (Yrs.)  | Minimum (No.) | Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36 (i)(Rs. Per Month) |
| 1.   | Graduate Engineer                                 | Civil   | Project Manager   | 20 years in Building Construction  | 1             | Rs.60000/- per month  |
| 2.   | Graduate Engineer                                 | Civil<br>Electrical   | Dy. Project Manager   | 12 years in Building Construction  | 2<br>1        | Rs.40000/- per month per person   |
| 3.   | Graduate Engineer<br>Or<br>Diploma Engineer       | Civil<br>Electrical<br>HVAC   | Project/Site/<br>Billing<br>Engineer                        | 5 years for Graduate Engineer<br><br>Or<br>10 years for Diploma Engineer   | 4<br>1<br>1   | Rs.25000/- per month per person   |
| 4.   | Graduate Engineer                                 | Civil<br>Electrical   | Quality Engineer  | 8 years  | 1<br>1        | Rs.25000/- per month per person   |
| 5.   | Diploma Engineer                                  | Civil   | Surveyor  | 8 Years  | 1             | Rs.15000/- per month per person   |
| 6.   | Graduate Engineer                                 | Civil<br>Electrical   | Project Planning /Billing Engineer                          | 6 years  | 1<br>1        | Rs.20000/- per month per person   |
| Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers |   |   |   |  |               |   |

|   |   |  |
|---|---|--|
| Diploma holder with 10 years relevant experience with a reputed construction company can be treated at par with graduate Engineer for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of the requirement of Graduate Engineers. Technical Manpower for Minor Components (Electrical/HVAC) to be deployed only from the start of the activities for the respective components. |   |  |
| <b>Clause 39</b>  | Authority having option of terminating the Contract in event of death of Contractor   | Tender Accepting Authority                           |
| <b>Clause 42</b>  |   |  |
| i)  | a) Schedule/statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule of Rates 2014 printed by CPWD | D.S.R.2016   |
| ii.)  | <b>Variation permissible on theoretical quantities</b>  |  |
|   | a) Cement for works with estimated cost put to tender not more than Rs. 5 lakhs.  | <b>3% plus/minus</b>                                 |
|   | For works with estimated cost put to Tender is more than Rs. 5 lakhs.   | <b>2% plus/minus</b>                                 |
|   | b)Bitumen all works   | <b>2.5% plus &amp; only &amp; nil on minus side.</b> |
|   | c) Steel reinforcement and structural steel Sections for diameter, section and category.  | <b>2% plus/minus</b>                                 |
|   | d)All other materials   | <b>Nil</b>   |

| <b>RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION</b> |                            |  |   |
|---|----------------------------|--|---|
| <b>S. No.</b>   | <b>Description of item</b> | <b>Rates in figure and words at which recovery shall be made from the contractor</b> |   |
|   |                            | <b>Excess beyond permissible variation</b>   | <b>Less used beyond permissible variation</b> |
| 1   | Cement                     | Nil  | 1.10(Base price + CI)                         |
| 2   | Steel reinforcement        | Nil  | 1.10(Base price + CI)                         |

**Annexure - I****A-List of Equipment for Field Testing Laboratory (Minimum)**

1. Balances
  - (i) 7 kg. to 10 kg. Capacity, semi-self-indicating type – accuracy 10 gm.
  - (ii) 500 gm. Capacity, semi-self-indicating type – accuracy 1 gm.
  - (iii) Pan balance- 5 kg. Capacity – accuracy 10 gms.
2. Ovens-electrically operated thermostatically controlled upto 1100C – sensitivity 10 C.
3. Sieves: as per Is 460-1962.
  - (i) I.S. sieves – 450mm internal dia, of sizes 100mm, 80mm, 63mm, 50mm, 40mm, 25mm, 20mm, 12.5mm, 10mm, 6.3mm, 4.75mm, complete with lid and pan.
  - (ii) I.S. sieves – 200mm internal dia (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns, with lid and pan.
4. Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
5. Equipment for slump test – Slump cone, steel plate, tamping rod, steel scale, scoop.
6. Dial gauges, 25 mm travel – 0.01 mm/ division least count – 2 nos.
7. 100 tonnes compression testing machine, electrical-cum manually operated.
8. Graduated measuring cylinders 200 ml capacity – 3 Nos.
9. Enamel trays (for efflorescence test for bricks).
  - (i) 300 mm x 250 mm z 40 mm – 2 nos.
  - (ii) Circular plates of 250 mm dia – nos.
10. Cube Mould – as per requirement
11. Bitumen test apparatus (Penetration & bitumen content test)

Note: The above list is indicative and is bare minimum. However Contractors are advised to provide Laboratory Testing Equipments in required number so that Quality of work does not suffer due to shortage of Equipment.

**Annexure – II****B-Field Testing Instruments (Minimum)**

1. Steel tapes – 3m
2. Vernier calipers
3. Micrometer screw 25 mm gauge
4. A good quality plumb bob
5. Spirit level, minimum 30 cms long with 3 bubbles for horizontal vertical
6. Wire gauge (circular type) disc
7. Foot rule
8. Long nylon thread
9. Rebound hammer for testing concrete
10. Dynamic penetrometer
11. Magnifying glass
12. Screw driver 30 cms long
13. ball pin hamer, 100 gms
14. Plastic bags for taking samples
15. Moisture meter for timber
16. Earth resistance tests (for Electrical Divisions)
17. Meggar (for Electrical Divisions)

Note: The above list is indicative and is bare minimum. However Contractors are advised to provide Field Testing Equipments in required number so that Quality of work does not suffer due to shortage of Equipment.

**APPENDIX XV**  
**Notice for appointment of Arbitrator**  
**[Refer clause 25]**

To

The

.....

Dear Sir,

In terms of clause 25 of the agreement, particulars of which are given below, I/we hereby give notice to you to appoint an arbitrator for settlement of disputes mentioned below:

1. Name of applicant
2. Whether applicant is Individual/Prop. Firm/Partnership Firm/Ltd. Co.
3. Full address of the applicant
4. Name of the work and contract number in which arbitration sought
5. Name of the Division which entered into contract
6. Contract amount in the work
7. Date of contract
8. Date of contract Date of initiation of work
9. Stipulated date of completion of work
10. Actual date of completion of work (if completed)
11. Total number of claims made
12. Total amount claimed
13. Date of intimation of final bill (if work is completed)
14. Date of payment of final bill (if work is completed)
15. Amount of final bill (if work is completed)
16. Date of request made to Reviewing Authority for decision
17. Date of receipt of Reviewing Authority's decision
18. Date of appeal to you
19. Date of receipt of your decision.

Specimen signatures of the applicant  
 (only the person/authority who signed the contract should sign)

I/We certify that the information given above is true to the best of my/our knowledge.

I/We enclose following documents.

1. Statement of claims with amount of claims.
- 2.
- 3.
- 4.

Yours faithfully,

Copy in duplicate to:

1. The Engineer –in-charge

### Form of Performance Security (Guarantee) Bank Guarantee Bond

In consideration of the HSCC (I) Ltd (*Executing Agency*). (hereinafter called "*Executing Agency*") having offered to accept the terms and conditions of the proposed agreement between.....and ..... (hereinafter called "the said Contractor(s)") for the work..... (hereinafter called "the said agreement") having agreed to production of an irrevocable Bank Guarantee for Rs. .... (Rupees ..... only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We, ..... (hereinafter referred to as "the Bank") hereby undertake to pay to .....(*Executing Agency*) an amount not exceeding Rs. .... (Rupees..... Only) on demand by .....(*Executing Agency*).
2. We, .....(indicate the name of the Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demand from .....(*Executing Agency*) stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. .... (Rupees .....only)
3. We, the said bank further undertake to pay .....(*Executing Agency*) any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We, ..... (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of .....(*Executing Agency*) under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer- in-Charge on behalf of .....(*Executing Agency*) certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.
5. We, ..... (indicate the name of the Bank) further agree with .....(*Executing Agency*) that .....(*Executing Agency*) shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by .....(*Executing Agency*) against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of .....(*Executing Agency*) or any indulgence by .....(*Executing Agency*) the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.



6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
7. We, ..... (indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of .....(*Executing Agency*)in writing.
8. This guarantee shall be valid up to .....unless extended on demand by .....(*Executing Agency*).

Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs..... (Rupees .....) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guaranteeshall stand discharged.

Dated the .....day of .....for .....(indicate the name of the Bank)

### Form of Earnest Money Deposit Bank Guarantee Bond

WHEREAS, contractor..... (Name of contractor) (hereinafter called "the contractor") has submitted his tender dated ..... (date) for the construction of ..... (name of work) (hereinafter called "the Tender")

KNOW ALL PEOPLE by these presents that we ..... (name of bank) having our registered office at ..... (hereinafter called "the Bank") are bound unto the..... *Designated Authority of Executing Agency* (hereinafter called "the Engineer-in-Charge") in the sum of Rs..... (Rs. in words .....) for which payment well and truly to be made to the said Engineer-in-Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this .....day of ..... 20..... THE CONDITIONS of this obligation are:

- (1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;
- (2) If the contractor having been notified of the acceptance of his tender by the Engineer-in-Charge:
  - (a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required;

OR

- (b) fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor,

We undertake to pay to the Engineer-in-Charge up to the above amount upon receipt of his first written demand, without the Engineer-in-Charge having to substantiate his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date\* ..... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

Date .....

SIGNATURE OF THE BANK

Witness .....

SEAL

(SIGNATURE, NAME AND ADDRESS)

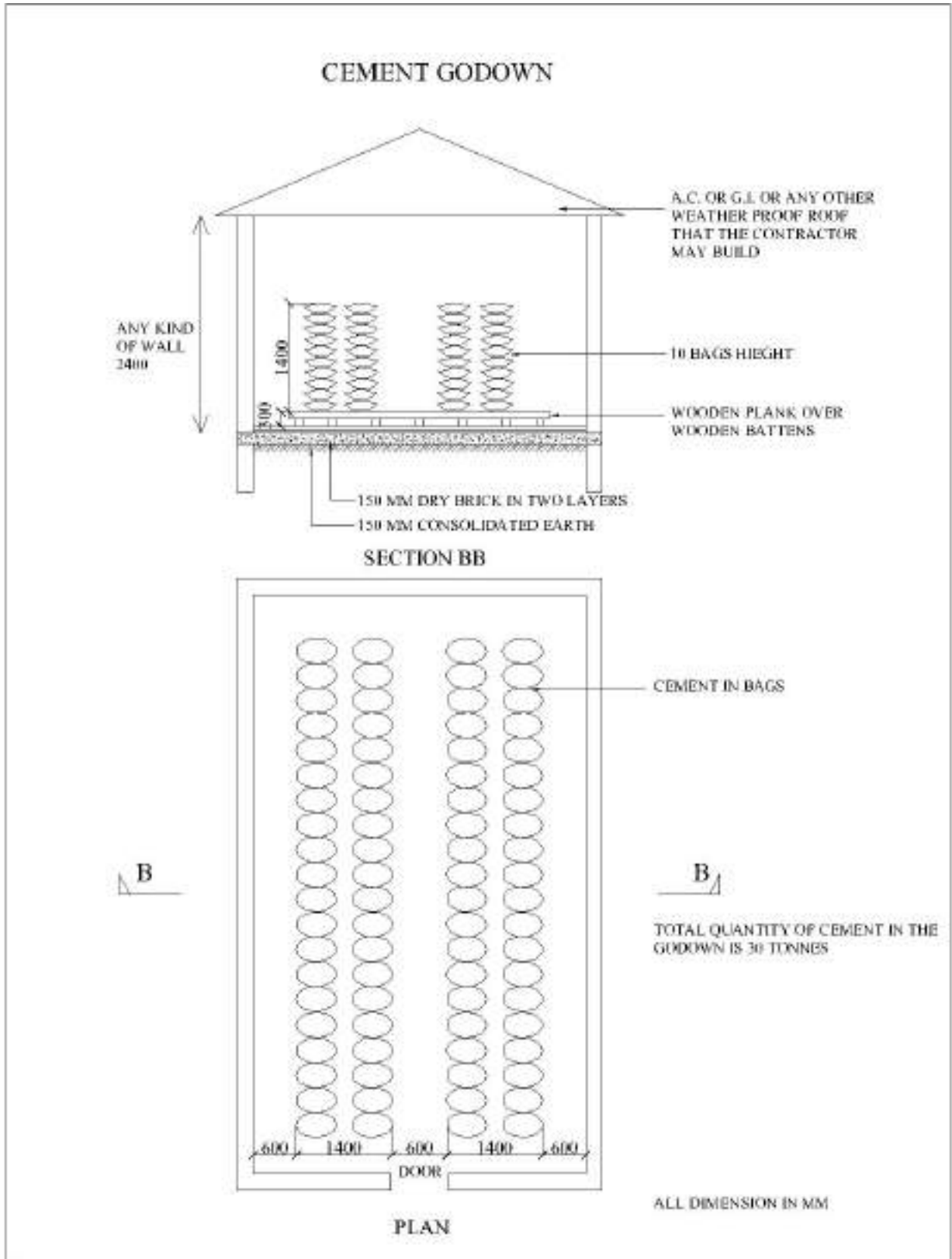
\*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

**Annexure to clause 34 (x) showing quantities of materials of areas of surfacing to be considered for working out minimum period for which hire charges of road roller are to be recovered.**

| S.No. | Material for Surfacing  | Qty. or Area |
|-------|---|--------------|
| 1.    | Consolidation of earth subgrade   | 1860 Sqm.    |
| 2.    | Consolidation of stones soling 15cm. to 22.5 cm thick   | 170 Cu.m     |
| 3.    | Consolidation of brick soling 10cm. to 20 cm thick  | 230 Cu.m     |
| 4.    | Consolidation of wearing coat of stone ballast 7.5cm to 11.5 cm thick   | 30 Cu. m     |
| 5.    | Consolidation of wearing coat of brick ballast 10 cm. thick   | 60 Cu. M     |
| 6.    | Spreading and consolidation of red bajri 6mm  | 1860 Sqm.    |
| 7.    | Painting one coat using stone aggregate 12.5 mm nominal size<br>a. @1.65 m <sup>3</sup> per 100 m <sup>2</sup> and bitumen A-90 or S-90 @ 2.25 Kg per m <sup>2</sup><br>b. @1.50 m <sup>3</sup> per 100 m <sup>2</sup> and bitumen emulsion or Road tar @ 2.25Kg per m <sup>2</sup>   | 930 Sqm      |
| 8.    | Paining two coats using -<br>a. For first coat, stone aggregate 12.5 mm nominal size:<br>i. @1.65 m <sup>3</sup> per 100 m <sup>2</sup> with paving bitumen A-90 or S-90 @ 2 Kg per m <sup>2</sup><br>ii. @1.35 m <sup>3</sup> per 100 m <sup>2</sup> with bitumen emulsion @ 2 Kg per m <sup>2</sup><br>iii. @1.25 m <sup>3</sup> per 100 m <sup>2</sup> with roadtar @ 2.25 Kg per m <sup>2</sup><br>b. For 2 <sup>nd</sup> Coat, stone aggregate 10mm nominal size 0.9 Cu.m per 100 Sq. m with -<br>i. 1 Kg of paving bitumen A-90 or S-90 or bitumen emulsion per Sqm<br>ii. 1.25 Kg of road tar, per Sqm | 600 Sqm      |

| S.No. | Material for Surfacing  | Qty. or Area |
|-------|---|--------------|
| 9.    | Re-paining with stone aggregate 10mm nominal size 0.9 Cu. M per 100 Sqm. With-<br>a. 1 Kg of paving bitumen A-90 or S-90 per Sqm<br>b. 1.25 Kg of bitumen emulsion per Sqm  | 1670 Sqm.    |
| 10.   | 2 cm premix carpet surfacing using 2.4 m3 of stone aggregate 10 mm nominal size per 100 m2 and binder including tack coat,, the binder being hot cut back bitumen or bitumen emulsion specified quantities.                                     | 930 Sqm.     |
| 11.   | 2.5 cm premix carpet surfacing using 3 m3 of stone aggregate 10 mm nominal size per 100 m2 and binder including tack coat,, the binder being hot cut back bitumen or bitumen emulsion specified quantities.                                     | 930 Sqm.     |
| 12.   | 4 cm thick bitumen concrete surfacing using stone aggregate 3.8 Cu. m (60% 20 mm nominal size and 40% 12.5 mm nominal size) per 100 m2 and coarse sand 1.9 Cu. m per 100 m2 and hot cut back bitumen over a tack coat of hot cut back bitumen.  | 460 Sqm.     |
| 13.   | 5 cm thick bitumen concrete surfacing using stone aggregate 4.8 Cu. m (60% 25 mm nominal size and 40% 20 mm nominal size) per 100 m2 and coarse sand 2.4 Cu. m per 100 m2 and hot cut back bitumen over a tack coat of hot cut back bitumen.    | 370 Sqm.     |
| 14.   | 6 cm thick bitumen concrete surfacing using stone aggregate 5.8 Cu. m (60% 40 mm nominal size and 40% 25 mm nominal size) per 100 m2 and coarse sand 2.9 Cu. m per 100 m2 and hot cut back bitumen over a tack coat of hot cut back bitumen.    | 280 Sqm.     |
| 15.   | 7.5 cm thick bitumen concrete surfacing using stone aggregate 7.3 Cu. m (60% 50 mm nominal size and 40% 40 mm nominal size) per 100 m2 and coarse sand 3.65 Cu. m per 100 m2 and hot cut back bitumen over a tack coat of hot cut back bitumen. | 230 Sqm.     |
| 16.   | 2.5 cm bitumasticsheet using stone aggregate 1.35 Cu. m (60% 12.5 mm nominal size, 40% 10mm nominal size) per 100 Sqm. and coarse sand 1.65 Cu. m per 100 Sqm. and hot cut back   | 750 Sqm.     |

| S.No. | Material for Surfacing  | Qty. or Area |
|-------|---|--------------|
|       | bitumen over a tack coat of hot cut back bitumen.   |              |
| 17.   | 4 cm bitumastic sheet using stone aggregate 2.6 Cu. m (60% 12.5 mm nominal size, 40% 10mm nominal size) per 100 Sqm. coarse sand 2.5 Cu. m per 100 Sqm. and hot cut back bitumen over a tack coat of hot cut back bitumen.  | 560 Sqm.     |
| 18.   | Laying full grouted surface using stone aggregate 40mm nominal size 6.10 Cu.m per 100 Sqm. with binder, binding with 20mm to 12.5mm nominal size stone grit. 1.83 Cu.m. per 100 Sqm. and seal coat of binder and stone grit 10mm nominal size, 1.07 Cu. m/100 Sqm the binder being hot bitumen or tar as specified.   | 460 Sqm.     |
| 19.   | Laying full grouted surface using stone aggregate 50mm nominal size 9.14Cu.m per 100 Sqm. with binder, with stone grit 20mm to 12.5mm nominal size stone grit. 1.83 Cu.m. per 100 Sqm. and seal coat of binder and stone grit 10mm nominal size, 1.07 Cu. m/100 Sqm the binder being hot bitumen or tar as specified. | 370Sqm.      |
| 20.   | 4 cm thick premix macadam surfacing using stone aggregate 25mm nominal size 4.57 Cu.m per 100 Sqm. and hot bitumen binding with stone aggregate 12.5mm nominal size 1.52 Cu.m per 100 Sqm. and seal coat of hot bitumen and stone aggregate 10mm nominal size 1.07 Cu.m per 100 Sqm.                                  | 560 Sqm.     |
| 21.   | 5 cm thick premix macadam surfacing using stone aggregate 25mm nominal size 6.10 Cu.m per 100 Sqm. and hot bitumen binding with stone aggregate 12.5mm nominal size 1.52 Cu.m per 100 Sqm. and seal coat of hot bitumen and stone aggregate 10mm nominal size 1.07 Cu.m per 100 Sqm.                                  | 460Sqm.      |



**END OF VOLUME - II**

**HSCC (India) Limited  
as Executing Agency on behalf of  
MINISTRY OF HEALTH & FAMILY WELFARE,  
NEW DELHI**

**TENDER**

**FOR**

**Construction of Hospital and Academic Campus  
at  
All India Institute of Medical Sciences  
Mangalagiri Distt. Guntur (AP)**

**under  
Pradhan Mantri Swasthya Suraksha Yojana  
(PMSSY)**

**VOLUME – III  
Specific Conditions of Contract**

**JANUARY 2018**

**Executing Agency**



**HSCC (INDIA) LTD.**

**E-6(A), Sector-1, NOIDA(U.P) 201301 (India)**

Phone : 0120-2542436-40

Fax : 0120-2542447

**Tender No. HSCC/PMSSY/AIIMS/Guntur/H&A/2018**



## **INDEX**

| Clause No. | Descriptions   |
|------------|--|
| 1          | Definitions and Interpretation                       |
| 2          | Languages , Law & Jurisdiction                       |
| 3          | Errors, Omissions and Discrepancies                  |
| 4          | Scope of Contract                                    |
| 5          | Drawings   |
| 6          | Disruption of Progress                               |
| 7          | Further Drawings and Instructions                    |
| 8          | Contractor's General Responsibilities                |
| 9          | Watching & Lighting                                  |
| 10         | Care of Works  |
| 11         | Expected Risks & Force Majeure                       |
| 12         | Contractor's Superintendence                         |
| 13         | Compliance with Statutes, Regulations, Etc.          |
| 14         | Setting out  |
| 15         | Quality of Materials, Workmanship and Test           |
| 16         | Absence of Specifications                            |
| 17         | Obtaining Information's related to Execution of work |
| 18         | Access for Inspection                                |
| 19         | Examination of Work before covering up               |
| 20         | Variations   |

|      |  |
|------|--|
| 21   | Works by Other Agencies  |
| 22   | Insurance Policies   |
| 23   | Dues not paid by the Contractor  |
| 24   | Billing & Certification  |
| 25   | Urgent Repairs   |
| 26   | Boreholes & Exploratory Excavation   |
| 27   | Fossils, Etc.  |
| 28   | Plant Temporary Works & Materials  |
| 29   | Reports by Contractor  |
| 30   | Every Care   |
| 31   | Miscellaneous  |
| 32   | Co-ordination Meeting  |
| 32.1 | Site Development   |
| 32.2 | Contractor's Working Area  |
| 32.3 | Contractor's Temporary Structures  |
| 32.4 | Procurement of Various Materials   |
| 32.5 | Water Supply & Power Supply  |
| 32.6 | Site office  |
| 32.7 | Temporary Fencing  |
| 32.8 | Mix Design of Concrete   |
| 33   | Compliance of Statutory Obligations for obtaining completion<br>Certificates |
| 34   | Rates/Prices   |

35 Cash Flow targets

36 Arbitration

**ADDITIONAL SPECIFIC CONDITIONS OF CONTRACT**

| <b>Clause No.</b> | <b>Descriptions</b>  |
|-------------------|--|
| <b>(A)</b>        | <b>RELATING TO CIVIL, PLUMBING &amp; FIRE-FIGHTING WORKS</b> |
| 1.0               | General  |
| 2.0               | Scope of Contract  |
| 3.0               | Contract Drawings  |
| 4.0               | Shop Drawings  |
| 5.0               | Samples and Catalogues                                       |
| 5.2               | Approval of Materials  |
| 6.0               | Materials and Equipments                                     |
| 7.0               | Conformity with Statutory Acts, Rules and Standards          |
| 8.0               | Technical Data   |
| 9.0               | Manufacturer's Instructions                                  |
| 10.0              | Training and Operating Instructions                          |
| 11.0              | Inspection and Testing                                       |
| 12.0              | Test Certificates  |
| 13.0              | Performance Guarantee  |
| 14.0              | Quiet Operation and Vibration                                |
| 15.0              | Accessibility  |
| 16.0              | Electrical Installation                                      |
| 17.0              | Completion Certificate                                       |
| 18.0              | Completion Drawings  |

| <b>Clause No.</b> | <b>Descriptions</b>                         |
|-------------------|---|
| 19.0              | Rates                                       |
| 20.0              | Check List                                  |
| 21.0              | Repairs                                     |
| 22.0              | Control System                              |
| 23.0              | Reference Points                            |
| 24.0              | Licence & Permits                           |
| 25.0              | Cutting and making good                     |
| 26.0              | Operation and Running of entire system      |
| <b>(B)</b>        | <b>RELATING TO ELECTRICAL INSTALLATIONS</b> |
| 1.0               | General                                     |
| 2.0               | Regulations and Standards                   |
| 3.0               | Rates                                       |
| 4.0               | Completeness of Bid                         |
| 5.0               | Works to be Done by the Contractor          |
| 6.0               | Tools for Handling & Erection               |
| 7.0&7.1           | Terminology & Scope                         |
| 7.2               | Measurement                                 |
| 8.0               | Drawings                                    |
| 9.0               | Conduit/ Trunking Layout                    |
| 10.0              | Shop Drawings                               |
| 11.0              | Manufacturer's Instruction                  |
| 12.0              | Materials & Equipment                       |
| 13.0              | Scale                                       |

| <b>Clause No.</b> | <b>Descriptions</b>   |
|-------------------|---|
| 14.0              | Brochures & Data  |
| 15.0              | Approval of Shop Drawings   |
| 16.0              | Samples & Catalogues  |
| 17.0              | Approval of Materials   |
| 18.0              | Inspection, Testing and Inspection Certificate  |
| 19.0              | Schedule & Manner of Operation  |
| 20.0              | Performance Guarantee   |
| 21.0              | Conformity with Statutory Acts, Rules & Standards                                     |
| 22.0              | Completion Drawings (As Built Drawings)   |
| 23.0              | Confirmation of Quantities  |
| 24.0              | Terms of Payment  |
| 25.0              | Training of Personnel   |
| 26.0              | Completion Certificate  |
| 27.0              | Check List  |
| 28.0              | Repairs   |
| 29.0              | Safe Custody & Storage  |
| 30.0              | Testing and Commissioning   |
| 31.0              | Operation and Running of entire system  |
| 32.0              | Layout of all services , operating and maintenance Instructions. DO's and Don't's etc |

**(C) SPECIFIC CONDITIONS OF CONTRACT RELATING TO HVAC SYSTEM**

- 1.0 General
- 2.0 Scope of Contract
- 3.0 Stores & Materials
- 4.0 Supply of Equipment
- 5.0 Working Drawings
- 6.0 Completion Drawings
- 7.0 Operation and Service manuals
- 8.0 Inspection at Contractors premises
- 9.0 Subcontracting
- 10.0 Material Submittals
- 11.0 Sample & Prototype
- 12.0 Testing & Commissioning
- 13.0 Provisional taking over
- 14.0 Operation of Plant
- 15.0 Guarantee & Defect liability period
- 16.0 Measurement of Works
- 17.0 Variation in Quantities
- 18.0 Maintenance
- 19.0 Performance Guarantee
- 20.0 Painting
- 21.0 Safe custody & Storage
- 22.0 Terms of Payments

- 23.0 Training of Personnel
  - 24.0 Handing over Taking over process
  - 25.0 Operation and Running of entire system
- (D) Additional Specific Conditions of Contract relating to Environmental Clearance & “Green Rating of Integrated Habitat Assessment (GRIHA) Rating System”
-



## SPECIFIC CONDITIONS OF CONTRACT (SCC)

### **1. Definitions and Interpretation**

In construing these conditions, the specifications, Bill of Quantities and Contract agreement etc the following words and expression shall have the meaning herein assigned to them except where the subject and context otherwise require.

- (a) “Act of Insolvency” shall mean any Act of Insolvency as defined by the Presidency Towns Insolvency Act or Provincial Insolvency Act or any Act amending such original.
- (b) “Approved” means approved in writing, including subsequent written information of previous verbal approval and “approval” means approval in writing, including as aforesaid.
- (c) “As directed” means the direction given by the Engineer In-Charge/Client/HSCC (I) Ltd as Executing Agency.
- (d) “Bill of Quantities” or “Schedule of items” means the schedule and quantities of items, materials and rates, summaries etc. priced and completed and as finally accepted.
- (e) “Constructional Plant” means all appliances or things of whatsoever nature required in or about the execution or maintenance of the Works but does not include materials or other things intended to form or forming part of the Works.
- (f) “**Executing Agency**” shall mean Executing Agency appointed by the Ministry of Health & Family Welfare (MOHFW), Government of India for the works “Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (AP) under Pradhan Mantri Swasthya Suraksha Yojana (PMSSY).” HSCC (India) Ltd., having its corporate office at E-6(A), Sector 1, Noida UP-201301 has been appointed as Executing Agency for this project. The Executing Agency shall also have its office at the site. The word “Executing Agency” is synonymous with “Project Executing Agency” and “Consultant”.
- (g) “**Day**” means a calendar day of 24 hours (beginning and ending at 00 hrs and 24 hrs respectively) irrespective of number of hours worked or not worked in that day.
- (h) “**Drawings**” means the drawings prepared and issued by the Executing Agency and referred to in the tender and specifications and any modification of such drawings and such other drawings, calculations and technical information of a like nature as may, from time to time, be issued by the Executing Agency.

- (a) **“I.S.”** means latest revision of ‘Indian Standards Specification’ issued by Bureau of Indian Standards.
- (b) **“Constructional Plant”** means all appliances or things of whatsoever nature required in or about the execution or maintenance of the Works but does not include materials or other things intended to form or forming part of the Works.
- (c) **“Materials”** means the materials, apparatus, equipment, fittings, fixtures and all such other materials, which are incorporated in the work.
- (d) **“Month”** means calendar month without regard to the number of days worked or not worked in that month.
- (e) **“Net Prices”**: If in arriving at the contract amount or contract sum, the Contractor shall have added or deducted from the total amount of the items in the Tender any sum, either as a percentage or otherwise, then the net price of any item in the tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item and similar percentage or proportionate sum provided always that in determining the percentage or proportion of the sum so added or deducted by the Contractor, the total amount of any Prime cost items and provisional sums of money shall be deducted from the total amount of the tender. The expression “net rates” or “net prices” when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at.
- (f) **“Notice in writing”** or **“written notice”** shall mean notice in written, typed or printed characters, sent (unless delivered personally or otherwise proved to have been received) by registered post to the site office/ last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.
- (g) **“Permanent Works”** means the permanent works to be executed (including Plant) in accordance with the Contract.
- (h) **“Specifications”** means the specification included and / or referred to in the Tender document and any modification thereof or addition thereto as may from time to time be issued to the Contractor.
- (i) **“Temporary Works”** means all temporary works of every kind required in or about the execution and completion or maintenance of the Works and the remedying of any defects therein.
- (j) **“Urgent Works”** means any urgent works which in the opinion of the Client and/or Executing Agency becomes necessary at the time of execution and/or

during the progress of work to obviate any risk of accident or failure or to obviate any risk of damage to the structure of services or required to accelerate the progress of the work for which becomes necessary for safety and security or for any other reason the Client and or Executing Agency may find it necessary.

- (k) “**Week**” means seven calendar days without regard to the number of hours worked or not worked in any day in that week.
- (l) Words imparting the single only also include the plural and vice versa where the context requires.
- (m) The **Engineer-in-charge** means the Engineer Officer as mentioned in Schedule ‘F’ of GCC hereunder, authorized by the Department, who shall supervise and be in charge of the work.
- (n) **Client** or **MoH&FW** means Ministry of Health & Family Welfare, Government of India, New Delhi.
- (o) The headings, subheadings and marginal notes (if any) and the catch lines and the Annexure hereto are meant only for convenience of reference and shall not be in any way be taken into account in the interpretation of these presents and the Annexure hereto. The Contractor shall have to carry out and complete the works in every respect in accordance with this contract.

## 2. Languages, Law & Jurisdiction

The ruling language in which the Contract and related aspects shall be drawn up shall be English only. The contract its meaning and interpretation & relationship between the parties shall be governed by Laws of India and as applicable to site of work. Notwithstanding any other Court/ Courts having jurisdiction to decided the question(s) forming the subject matter of the reference, if the same had been the subject matter of a suit any and all actions and proceeding arising out of or in relation to the Contract (including any arbitration in terms thereof) shall lie only in the Court of Competent Civil Jurisdiction at Delhi and only the said Court(s) shall have jurisdiction of entertain and try any such action(s) and / or proceeding(s) to the exclusion of all other Courts.

## 3. Errors, Omissions and Discrepancies.

- (a) In case of errors, omissions and /or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications, etc. the following order of precedence shall apply:
  - i. Between scaled and written dimension (or description) on drawing, written dimension shall be adopted.

- ii. Between the written or shown description or dimensions in the drawings and the corresponding one in the specification, the former shall be taken as correct.
  - iii. Between the written description of the item in the specifications and descriptions in the Bill of Quantities of the same item, the latter shall be adopted.
- (b) The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguity or discrepancies in conditions or specifications the same shall be explained and adjusted by Engineer-in-charge. In case the Contractor does not agree with the explanation given by the Engineer-in-charge, then the matter, on his written notice, will be referred to the Client and his decision shall be final and binding to the contractor.
- (c) In all cases of omissions and /or doubts or discrepancies in any of the items or specifications, a reference shall be made to the Engineer-in-Charge. Elucidation, elaboration or decision of the Engineer-in-charge shall be considered as authentic. The Contractor shall be held responsible for any error that may occur in the work through lack of such reference and precaution.

#### **4. Scope of Contract**

The scope of work comprises of “Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Mangalagiri Distt. Guntur (AP) including internal electrification, HVAC, PHE, fire fighting and external developments work etc. and their Maintenance during Defect Liability Period.”

Prior approval of all specialized agencies for specialized works shall be obtained by the Contractor from the Executing Agency before start of work.

The Contract comprises the Construction, completion, remedying the defects of the works and except insofar as the Contract otherwise stipulates, the provision of all labour, materials, constructional plant, machinery, temporary works and everything, whether of a temporary nature required in and for such construction, completion and maintenance so far as necessary for providing the same as specified in or reasonably to be inferred from the Contract.

1. Detailed architectural RFC Drawings for Architecture and Structure shall be provided by Executing Agency to the contractor. The Contractor will prepare, shop drawings based on the drawings given by Executing Agency for all services eg. Electrical, Plumbing, etc based on the schematic drawings given by the Executing Agency, as required. The contractor shall make all necessary co-ordination.
2. The surveyed site plan and Master plan along with the report of geotechnical investigation are available and will be made available to finally selected Contractor.

3. The activities to be carried out for the completion of the Project shall include the following and any additional activities incidental to these:
  - a. Buildings as specified.
  - b. Internal and external services as per drawings
  - c. Getting all approvals / permissions / planning permits of the statutory / local / governmental agencies as required incidental to construction/ completion.
  - d. Submission of the completion (i.e. 'as-built') drawings and other related documents, both a hard copy and the soft copy in Auto CAD or any other IT application used for the purpose.
  - e. Preparation of specifications and vender list (in case not already provided) for all equipment wherever necessary and called upon to do so and getting these approved from client.
  - f. Obtaining occupancy certificate and related NOC's from statutory/ local/governmental agencies. Statutory payment on this account will be reimbursed by the client at actual.
  - g. Executing the work in a befitting manner to obtain GRIHA Certification (minimum 3 Star) for the building including engaging a Consultant to assist the Contractor in obtaining the rating. Licence/Application fee, if any, shall be reimbursed by the Executing Agency to the Contractor on actuals.

#### **4.1.1 Approvals Required**

The Contractor shall obtain all pre & post construction clearances/approvals from Municipal and other relevant statutory authorities/local bodies including Water supply agencies concerned, Electric Supply and inspectorate. Agencies concerned, such as, but not limited to, Police and Security Agencies, Chief Controller of Explosives, Fire Department, Civil Aviation Department, concerned in accordance to prevailing rules, Building Bye-Laws, tree cutting etc., as the case may be with related to/ required for Construction/Completion. All expenditure on this account will be borne by the contractor. The applications for pre-construction clearances submitted/applied to local authorities shall be provided to the contractor for obtaining clearances/approvals.

The approvals shall include the following in addition to any other approval which may be required for the project.

- Construction Permit if required
- NOC from Chief Fire Officer
- NOC from Lift Inspector where lifts are provided
- Occupancy certificate
- GRIHA Certification (Minimum 3 Star)

HSCC/Client may, at the written request of the Contractor, assist him in obtaining the approvals from relevant authorities. However any such request by the Contractor shall not bind the HSCC in any manner.

The contract comprises the construction, completion, remedying the defect of the works operation & maintenance during defect liability period and except in so far as the

Contract otherwise stipulates, the provision of all labour, materials, constructional plant, machinery temporary works and everything, whether of a temporary or permanent nature required in and for such construction, completion and maintenance so far as necessary for providing the same as specified in or reasonably to be inferred from the Contract.

## 5. Drawings

### (a) Tender Drawings

The tender drawings are for Tender Purpose only and are intended as a guide to the Bidder / Contractor and give general layout of buildings and general information of the structures and general positions of utilities, services and equipments only. Contractor's quoted rate for any item should not be based on any measurement, quantity, and specification from these drawings. Any claim raised by the contractor in this regard shall not be valid in this contract and shall not be accepted by the Executing Agency.

### (b) Issue and custody of drawings & specifications

The contractor on the signing of contract shall be furnished free of cost three copies of all drawings and all further drawings issued during the progress of the works. The contractor shall keep one copy of all drawings at the works site and the Client/Engineer-in-charge/Executing Agency shall have, at all reasonable times, access to the same.

The drawings shall be provided to the Contractor as per the schedule (prepared at the starting of the works and necessarily updated or revised time to time) mutually agreed by the Engineer-in-charge and the Contractor. Last major drawings may be provided as per the schedule prior to the stipulated date of completion and the Contractor, if found necessary shall increase his resources and effort so as to complete the works within stipulated time

From time to time during the course of contract revised drawings may be issued to the Contractor and the Contractor shall ensure that all superseded drawings are removed from site and stored in a lockable cabinet as directed by the Engineer-in-charge and replaced by revised drawings.

The Contractor shall maintain complete up to date Register of drawings to be maintained at site. All drawings shall be properly filed and indexed for ready reference.

The contractor shall ensure that only the valid up to date drawings are used for setting out, construction and preparation of working drawings etc.

Detail drawings in all cases shall be worked to in preference to those of a more general nature and figured dimensions where indicated shall be followed in preference to scaled dimensions.

(c) Bar Bending Schedule

Contractor shall prepare bar bending schedules in the prescribed proforma as approved by the Engineer-in-charge for prior approval of the Engineer-in-charge or his authorized representative. However, the approval does not relieve the Contractor from his liability for bending, placing and binding reinforcements as per the approved drawings.

(d) Working drawings/ shop drawings/Design :

The drawings supplied by the Engineer-in-charge have been listed in the tender documents.

These drawings are indicating for the purpose of detailing the intent and requirement of the contracts. The contractor shall take into consideration by space allocated for equipments before ordering them to ensure that the equipment would fit in the space provided with necessary clearances required as per the relevant standard/ manufactures recommendations.

Structural and Architectural drawings shall be provided by Executing Agency to the contractor. However, to ensure the uninterrupted progress of work, and timely completion, the contractor may be required to do further detailing as per the site requirement on his own. The Contractor will prepare shop drawings based on the drawings given by client/ Executing Agency for all services eg. Electrical, Plumbing, etc.

All drawings shall be signed by Contractor's authorised representative with name, seal and date before submission to Engineer-in-charge.

In case there is delay in any drawings and design viz shop drawings, as made drawings etc. in preparation, design, quality, submission, etc. the Executing Agency may ask the Contractor to change their design consultant immediately or get the same done on risk and cost of the Contractor.

**6. Disruption of Progress**

- (a) The Contractor shall give adequate but not less than 4 weeks written notice to the Engineer-in-charge whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is required to be issued by the Executing Agency. The notice shall include details of the drawing or order required explaining why and by when it is required and of any delay or disruption likely to be suffered if it is late.

- (b) If by reason of any failure or inability of the Executing Agency to issue within 4 weeks any drawing or instruction for which notice has been given by the Contractor in accordance with Sub-clause 1) and the contractor suffers delay, then the Engineer-in-charge, shall on the request of the Contractor recommend to the Client any extension of time under respective clause. Notwithstanding anything stated above, the Contractor shall not be eligible for any financial compensation arising out of the above.

## **7. Further Drawings and Instructions**

The Contractor shall carry out and complete the said work in every respect in accordance with this Contract and with the directions of and to the satisfaction of the Executing Agency. The Executing Agency may in his absolute discretion and from time to time further issue drawings and/or written instructions, details, directions and explanations, which are hereafter collectively referred to as “Executing Agency’s Instructions” in regard to:

- (a) The variation or modification of the design, quality or quantity of items of works or the addition or omissions or substitution of any item.
- (b) Any discrepancy in the drawings or between the bill of quantities and/or drawings and/or specification.
- (c) The removal from the site of any material brought thereon by the contractor and the substitution of any other material therefore.
- (d) The removal and/or re-execution of any works executed by the contractor.
- (e) The dismissal from the works of any persons employed thereupon.
- (f) The opening up for inspection of any work covered up.
- (g) The amending and making good of any defects under clause thereof.

The contractor shall forthwith comply with and duly execute any work comprised such as Executing Agency’s instructions provided always that verbal instructions, directions and explanations given to the contractor or his representative upon the works by the Executing Agency, shall, if involving a variation, be confirmed in writing by the Contractor within seven days, and if not dissented from in writing within a further seven days by the Executing Agency, such shall be deemed to be Executing Agency’s instructions within the scope of the contract

## **8. Contractor’s General Responsibilities**

- (a) Execution of works:



The Contractor shall, subject to the provisions of the Contract, and with due care and diligence, execute and complete the Works & remedy any defects therein in accordance with the Contract. The Contractor shall provide all labour, including the supervision thereof, materials, Constructional Plant and Machineries and all other things, whether of a temporary or permanent nature, required in and for such execution, completion, maintenance and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

If the contractor finds any discrepancy in the drawings or between the drawings, bill of quantities and specifications, he shall immediately and in writing refer the same to the Executing Agency who shall decide which is to be followed

The contractor is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the bill of quantities and rates instructions in respect of such additional items and their quantities will be issued in writing by the Executing Agency.

The Contractor must bear in mind that all the work shall be carried out strictly in accordance with the specifications as given in these documents and also in compliance of the requirements of the local public authorities and to the requirements / satisfaction / direction of the Executing Agency/Engineer-in-charge and no deviation of any account will be permitted.

The contractor shall have to use materials from the makes / manufacturers specified in the list of materials of approved brand and/or manufacture contained in the contract documents and as approved by the Executing Agency. Wherever different pattern/ Design/ Quality of materials with same specification/ make as specified in the contract, is available in the market, Executing Agency/Engineer-in-Charge will approve the pattern/ Design/ Quality of the material/ item which shall be final and binding on the contractor.

The Executing Agency is empowered to cancel an approval of material if subsequently it is found that approved material once brought at site and tested does not meet the requirement as specified in the contract. In such case the Executing Agency will accord approval of alternate material.

(b) Adequacy, stability and safety:

The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction.

(c) Temporary works and arrangements:

The Contractor shall furnish to the Executing Agency full particulars, drawings, etc. of all temporary works necessary for the execution of the works and shall allow sufficient time for the Executing Agency to consider the same. The Executing Agency reserves the right to comment on the Contractor's proposals if they consider that modifications should be made. The Contractor shall be solely responsible for the stability and safety of all temporary works including obtaining statutory approvals and payment of statutory fees, if any. The Executing Agency will indicate the site(s) for such temporary works and the Contractor will have to restrict his requirements to the same. Should it be necessary to shift the temporary works to some other allotted place during the execution of the works, the Contractor shall do so, when informed by the Executing Agency, at his own cost and without delay or demur. Such shifting of temporary works may be in part or in full.

(d) Initial and Final Clearance of site for temporary works:

The Contractor shall be responsible for the clearance of the site of all scrub, debris, rubbish, etc. to be removed off site to a location to be provided by the contractor and approved by the Engineer-in-charge. However, no tress shall be removed without the prior permission of the Engineer-in-charge. The structures, services and works required to be demolished and removed shall also be removed off site to a location as mentioned above. The Contractor shall obtain necessary permissions and approvals from the local authorities for such disposals. The demolition shall include digging, excavating and removal of substructures, foundations and buried works. The cost of all this shall be borne by the Contractor.

The above is applicable for all site offices, labour camps, and godowns etc., which are not required after the works is fully completed.

(e) Storage, Cleaning and Dewatering

The Contractor shall at all the times during construction keep the Site clean and free from all debris and unwanted materials on a daily basis as per instructions of the Engineer-in-charge.

Storage of materials shall be in an organized manner and in proper compartments as directed by Executing Agency. Storage on suspended floors shall not be permitted unless specifically approved in writing by the Executing Agency for specific materials in specific locations and in approved manner. The Executing Agency shall be furnished with load details, if requested, before seeking approval for storage.

Regular cleaning operations shall be undertaken to remove all dust, debris, waste materials etc. A cleaning schedule shall be maintained.

Contractor shall make his own arrangement for storage of those materials, which can be accommodated at site. Contractor shall be fully responsible for safe custody of the same. Materials shall be considered as “Delivered at Site” only after the physical presence of materials at site are verified by the Executing Agency. Stores elsewhere shall not be eligible for being considered as “Delivered at Site.”

Contractor shall be responsible to keep entire site free from water due to water coming from any source at any level and shall protect all materials and works from being damaged by the water from any source. Contractor shall make proper arrangements for drainage prior to use of water for curing, testing, cleaning etc.

Any expenditure incurred by the Contractor in fulfillment of his obligations under this sub-clause shall be deemed to have been included in the Contract Sum.

## **9. Watching & Lighting**

The Contractor shall throughout the execution and completion of the Works and the remedying of the site and the Works and the remedying of any defects therein have full regard for the safety of all persons entitled to be on the site and keep the site and the Works in an orderly state appropriate to the avoidance of danger to such persons and in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the Executing Agency, or by any duly constituted authority, for the execution and for the protection of the Work, and/or for the safety and convenience of the public or others and take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to person or property of the public or others resulting from pollution, noise and other causes as a consequence of his methods of operation.

## **10. Care of Works**

From the commencement to the certified completion of the whole of works, the contractor shall take full responsibility for the care thereof and of all temporary works and in case any damage loss or injury shall happen to the works or to any part thereof or to any temporary works from any cause whatsoever save and except the expected risks as defined in sub-clauses of Clause 12.

The contractor shall at his own cost repair and make good the same so that on completion, the works shall be in good order and condition and conformity to every respect with the requirements of the contract and Engineer-in-charge’s instructions. The contractor shall also be liable for any damage to the works occasioned by him including his subcontractors in the course of any operations carried out by him for the purpose of completing any outstanding work and complying with his obligations under clause 33 hereof. The contractor shall indemnify the Employer from all risks on this account.

## 11. Expected Risks & Force Majeure

### (a) Expected Risks

The “expected risks” are war, hostilities (whether war declared or not), invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, or (unless solely restricted to the Contractor or of his sub-Contractors and arising from the conduct of, their workmen) riot, commotion or disorder or radiation or contamination by radio-activity and other hazardous properties of any explosive, nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio active toxic explosive, nuclear assembly or nuclear component thereof, pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds, or any such operation of the forces of nature as an experienced contractor could not foresee, or reasonably make provision for on insure against all of which are herein collectively referred to as “the expected risk”

### (b) Force Majeure

- i) Any failure or delay in the performance by either party hereto of its obligations under his Contract shall not constitute a breach thereof or give rise to any claims for damages if, and to the extent that it is caused by occurrences beyond the control of the party affected, namely, acts of God, floods, explosions, wars, riots, storms, earthquakes, insurrection, epidemic or other natural disasters. The party so affected shall continue to take all actions reasonably within its power to comply as far as possible with its obligations under this Contract. The affected party shall promptly notify the other party after the occurrence of the relevant event and shall use every reasonable effort to minimize the effects of such event and act in all good faith with due care and diligence.
- ii) In the event of the effect of force majeure continuing beyond the period of One hundred and eighty (180) days, the parties shall mutually decide whether or not to terminate this Contract. In the event of termination of contract the contractor shall be paid for the work done and which has been accepted and certified by the Executing Agency and shall not assert any additional claims against the Client.

## 12. Contractor’s Superintendence

- (a) The contractor shall be solely responsible for the means, methods, techniques sequence and procedure of construction. The Contractor shall be responsible to see the completed work complies accurately with the Contract Document.

The Contractor shall give or provide all necessary superintendence during the execution of the Works.

(b) Unauthorized Persons

No unauthorized persons are allowed on the site. The Contractor shall instruct all such persons to keep out and shall take steps to prevent trespassing. However the contractor will make sure to provide free access at any time for Engineer-in-charge/Client/Executing Agency to the site and other working places.

**13. Compliance with Statutes, Regulations, Etc.**

The contractor shall conform to the provisions of any statute, ordinance, law, act of the legislature relating to the works, and to the regulations and by-laws of any local or other duly constituted authority and of any water, electric supply and other companies and/or authorities with whose systems the structure is proposed to be connected. The Contractor shall keep the Client/Engineer-in-charge/Executing Agency indemnified against all fines or penalties or liability of every kind for breach of any such statutory ordinance, law act of the legislation, regulations, and byelaws as aforesaid.

The contractor shall before making any variations from the drawings or specifications that may be necessitated by so regulations, give to the Engineer-in-charge written notice, specifying the variation proposed to be made and the reasons for making it and apply for instructions thereon. The contractor will not execute any work without written permission from the Engineer-in-charge/Executing Agency.

The contractor shall bring to the attention of the Engineer-in-charge/Executing Agency all notices required for execution by the said acts, regulations or bye-laws to be given to any authority and pay to such authority, or to any public office all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Engineer-in-charge/Executing Agency.

**14. Setting out**

The contractor shall be responsible for the true and proper setting-out of the Works in relation to original points, lines and levels or reference issued by Engineer-in-charge/Executing Agency in drawing or in writing and for the correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of works and for the provision of all necessary instruments, appliances and labour in connection therewith. If, at any time during the progress of the works, and during defects liability period, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required to do by the Engineer-in-charge/Executing Agency and / or Client or his authorised representative shall at his own cost, rectify such error to the satisfaction of the Engineer-in-charge. The checking of any setting out or of any line or level by the Executing Agency shall not in any way relieve

the Contractor of his responsibility for the correctness thereof. The Contractor shall carefully protect and preserve the benchmarks; sight-rails, pegs and other things used in setting-out the Works. Any rectification works required should be done by the Contractor at his own cost.

## 15. Quality of Materials, Workmanship and Test

The Client/Engineer-in-charge/Executing Agency may carry out Third Party Quality Assurance/Audit by an independent agency/ individual/firm/institute at any time. The agency will be permitted and offered all support related to site inspection by the Contractor. Suggestions therein will be carried out without any extra cost.

### 15.1 Samples

The approval of Samples by the Executing Agency shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Document unless Contractor has in writing called the Executing Agency/Engineer-in-charge's attention to each such variation at the time of submission as specified above and received written approval of each such variation by specific written notation thereof incorporated in or accompanying the Sample approval; nor will any approval by Engineer-in-charge /Executing Agency relieve Contractor from responsibility for complying with the requirements of contract.

Only when the samples are approved in writing by the Executing Agency, the contractor shall proceed with the procurement and installation of the particular material / equipment. The approved samples shall be signed by the Executing Agency for identification and shall be kept on record at site office until the completion and acceptance of the work and shall be available at the site for inspection / comparison at any time. The contractor shall keep with him a duplicate of such samples to enable him to process the matter.

For items of works where the samples are to be made at the site, the same procedure shall be followed. All such samples shall be prepared at a place where it can be left undisturbed until the completion of the project.

The Executing Agency shall communicate his comments / approval to the Contractor to the samples at his earliest convenience. Any delay that might occur in approving of the samples for reasons of its not meeting with the specifications or other discrepancies, inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials / equipment's etc. shall be to the account of the contractor. In this respect the decision of the Engineer-in-charge shall be the final.

On delivery of the supplies of materials / equipments for permanent works at the site, the contractor shall specifically arrange to get the supply inspected by the Executing Agency and compared with the approved sample and his specific obtained before using the same in the work.

## 15.2 Testing facilities

The Contractor shall, at his own cost, provide testing facilities as per CPWD scale and IS Codes at site as stipulated in the CPWD Works manual / as per Contract document or as directed by the Executing Agency/Engineer-in-charge.

The laboratory shall be equipped and manned by the Contractor at his own cost with all necessary apparatus to carry out the above mentioned tests in accordance with relevant Indian Standards or equivalent approved Standards.

i) Cement testing:

Tests for fineness, Strength, setting time and soundness in accordance with IS:4031.

ii) Concrete Testing:

Test for workability, proportions, density and strength in accordance with IS:516 and 1199. In particular the cube testing machine shall be cable of exerting a slowly applied force up to 200 tonnes and the platens shall be suitable for crushing both 150mm and 200 mm cubes. A Vibrating table of suitable design shall be provided for compaction of cubes.

iii) Aggregate Testing:

In accordance with IS: 2386 (part I to VIII) for the following tests on both fine and coarse aggregates:

- a. Sieve analysis
- b. Determination of bulk density and voids on fine aggregates only:
- c. Determination of moisture content, specific gravity and absorption on coarse aggregates only:
- d. Determination of specific gravity and absorption

The contractor shall carryout inspection, testing, checks and also shall maintain records of inspection, testing & checks of material, works and activities related to construction works in the ISO 9001 quality system formats, checklists etc. to be given by Executing Agency during execution period. After getting approval from

the Engineer, The contractor shall print at his own cost all forms, tables, formats etc.

The laboratory shall be connected to the main water and electricity Services. It shall also be supplied with portable gas equipment.

On completion of the Maintenance period, the laboratory is to be dismantled and removed from Site. The dismantled materials and equipment shall be the property of the Contractor.

In case certain tests are to be carried out in approved outside laboratory, as stipulated in the contract document / as directed by the Executing Agency, the Contractor shall bear the entire cost including samples, taking samples, testing, reports etc.

**16. Absence of Specifications**

If the specifications do not contain particulars of materials and works which are obviously necessary for the proper completion of the works, and the intention to include, which is inferred, all such materials and works shall be supplied and executed by the Contractor without extra charge. If the Contractor requires additional information, he shall, in pursuance of Clause 2 hereof, so request in writing well in advance to commencement of the particular work to the Executing Agency who will issue such detailed information within a reasonable time.

**17. Obtaining Information's related to Execution of work**

No claim by the Contractor for additional payment will be entertained which in consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the works, nor will any misunderstandings or the obtaining of incorrect information or the failure to obtain information relieve him from any risks or from the entire responsibility for the fulfillment of the contract.

**18. Access for Inspection**

Persons nominated by Engineer-in-charge/Executing Agency shall at all reasonable times have free access to work and/ or to the workshops, factories or other places where materials are lying or from which they are being obtained and the Contractor shall extend necessary service to Engineer-in-charge/Executing Agency and their representatives every facility necessary for checking measurements, inspection and examination and test of the materials and workmanship.

**19. Examination of Work before covering up**

- (a) No part of the works shall be covered up or put out of view without the written approval of the Executing Agency and the contractor shall afford full opportunity



for the Executing Agency to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The contractor shall give due notice to the Executing Agency whenever any such work or foundation is or ready or about to be ready for examination and the Executing Agency shall, without unreasonable delay, unless he considers it necessary and advises the contractor accordingly, attend for purpose of examining and measuring such work or examining such foundation.

(b) **Uncovering and making openings**

The contractor shall uncover any part or parts of the works or make openings in or through the same as the Executing Agency may from time to time direct and shall reinstate to make good such part or parts to the satisfaction of the Executing Agency. No extra payment will be paid for this.

**20. Variations**

- (a) The Executing Agency shall make a variation in the form, quality or quantity of the works or any part thereof that may be necessary and for that purpose or if for any other reason it shall, in his opinion be desirable, he shall order the contractor to do and the contractor shall do any of the following:
- i) Increase or decrease the quantity of any work included in the contract
  - ii) Change the character or quality or kind of any such work
  - iii) Change the levels, lines, positions and dimensions of any part of the works.
  - iv) Execute additional work of any kind necessary for the completion of the works.
  - v) Change any specified sequence or timing of construction of any part of the work.

No such variation shall in any way vitiate or invalidate the contract, but the cost, if any, of all such variations shall be taken in account for payment to the contractor as an addition or adjustment to the amount of the contract sum. Provided that where the issue of instruction to vary the works is necessitated by some default or breach by the contractor or for which he is responsible, any additional cost attributable to such default or breach shall be borne by the contractor.

- (b) The Executing Agency shall omit any component from scope of works that may be necessary and for that purpose or if for any other reason it shall, in his opinion be desirable and shall issue such instructions to the contractor. The contractor shall do the same without in any way vitiate or invalidate the contract. Any cost attributable to above shall be borne by the contractor.
- c) Orders for variation to be in writing

The contractor shall make no such variations without an order in writing by the Executing Agency, provided that no order in writing shall be required for increase up to 30% or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the schedule of items.

## 21. Works by Other Agencies

The Client/ Engineer-in-charge/Executing Agency reserves the right to use premises and any portion of the site for the execution of any work not included in this contract which it may desire to have carried out by other persons simultaneously, and the contractor shall allow the reasonable facilities for the execution of such work, but shall not be required to provide any plant or material for the execution of such work except by special arrangement with the employer. Such work shall be carried out in such manner as not to impede the progress of the works included in the contract and the contractor shall not be responsible for any damage or delay which may happen to or occasioned by such work.

## 22. Insurance Policies

### 22.1.1 Employer's Risks

**The Employer's risks are:**

- (a)
  - (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
  - (ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,
  - (iii) ionising radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
  - (iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speed,
- (b) loss or damage due to the use or occupation by the **Employer** of any Section or part of the Permanent Works, except as may be provided for in the Contract,
- (c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible,  
and

- (d) any operation of the forces of nature (insofar as it occurs on the site) which an experienced contractor:
  - (i) could not have reasonably foreseen, or
  - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
    - (A) prevent loss or damage to physical property from occurring by taking appropriate measures, or
    - (B) insure against.

### 22.1.2 Insurance of Works and Contractor's Equipment

The Contractor shall, without limiting his or the HSCC/Employer's obligations and responsibilities under Clause 22.1.1 insure:

- (a) the Works, together with materials and Plant for incorporation therein, to the full replacement cost and it being understood that such insurance shall provide for compensation to be payable to rectify the loss or damage incurred.
- (b) the Contractor's Equipment and other things brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

The insurance under clause 22.1.2 shall be issued by an insurance company which has been determined by the contractor to be acceptable to the Executing Agency.

### 22.1.3 Scope of Cover

The insurance in paragraphs (a) and (b) of Sub-Clause 22.1.2 shall be in the joint names of the Contractor and the HSCC/**Employer** and shall cover:

- (a) HSCC and the Contractor against all loss or damage from whatsoever cause arising (including natural calamities, earthquake, subsidence, landslide, rock slide, flood, storm, cyclone, fire, theft, burglary, strike, riot, sabotage, terrorism), other than as provided in Sub- Clause 22.1.5, from the commencement date until the date of completion in respect of the Works or any Section or part thereof as the case may be, and
- (b) the Contractor for his liability:
  - (i) during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of the Defects Liability Period, and

- (ii) for loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations during the Defects Liability Period.

It shall be the responsibility of contractor to notify the Insurance Company of any change in the nature and extent of the works and to ensure the adequacy of the Insurance cover at all times during the period of contract.

***The Insurance Policies (CAR & WC) shall be submitted on or before the Date of Commencement.***

#### **22.1.4 Responsibility for Amounts not recovered**

Any amounts not insured or not recovered from the insurers shall be borne by the **Employer** or the Contractor in accordance with their responsibilities Clause 22.1.1.

#### **22.1.5 Exclusions**

There shall be no obligation for the insurance in Sub-Clause 22.1.2 to include loss or damage caused by the risks listed under sub clause 22.1.1 para a (i) to (iv).

If the Contractor receives instructions from the HSCC/**Employer** to insure against War Risk, such insurance if normally available shall be effected, at the cost of the HSCC/**Employer**, with an Insurance Company acceptable to the Executing Agency and shall be in the joint names of the contractor and the HSCC/**Employer**.

#### **22.1.6 Damage to Persons and Property**

The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the **Employer** against all losses and claims in respect of:

- (a) death of or injury to any person, or
- (b) loss or damage to any property (other than the Works) :

Which may arise out of or in consequence of the execution and completion of the Works and the remedying of any defects therein, and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, subject to the exceptions defined in Sub-Clause-22.1.2.

#### **22.1.7 Exceptions**

The "exceptions" referred to in Sub-Clause 22.1.6 are:

- (a) the permanent use or occupation of land by the Works, or any part thereof,

- (b) the right of the **Employer** to execute the Works, or any part thereof, on, over, under, in or through any land,
- (c) damage to property which is the unavoidable result of the execution and completion of the Works, or the remedying of any defects therein, in accordance with the Contract.
- (d) death of or injury to persons or loss of or damage to property resulting from any action or neglect of the **Employer**, his agents, servants or other contractors, not being employed by the Contractor, or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or, where the injury or damage was contributed to by the Contractor, his servants or agents, such part of the said injury or damage as may be just and equitable having regard to the extent of the responsibility of the **Employer**, his servants or agents or other contractors for the injury or damage.

#### **22.1.8 Indemnity by Employer**

The **Employer** shall indemnify the Contractor against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the exceptions defined in Sub-Clause 22.1.7.

#### **22.1.8 Third Party Insurance (Including Employer's Property)**

The Contractor shall, without limiting his or the **Employer's** obligations and responsibilities under Clause 22.1.6 to 22.1.8, insure, in the joint names of the Contractor and the **Employer**, against liabilities for death of or injury to any person (other than as provided in Clause 22.1.11 to 22.1.12 or loss of or damage to any property (other than the Works) arising out of the performance of the Contract other than the exceptions defined in paragraphs (a), (b) and (c) of Sub-Clause 22.1.7.

#### **22.1.9 Minimum Amount of Insurance**

Such insurance shall be for at least the amount stated in Clause 22.1.2 above.

#### **22.1.10 Cross Liabilities**

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Contractor and to the **Employer** as separate insured.

#### **22.1.11 Accident or Injury to Workmen**

The **Employer** shall not be liable for or in respect of any damages or compensation payable to any workman other than for death or injury resulting from any act or default of the **Employer**, his agents or servants. The Contractor

shall indemnify and keep indemnified the **Employer** against all such damages and compensation, other than those for which the **Employer** is liable as aforesaid, and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

#### **22.1.12 Insurance Against Accident to Workmen**

The Contractor shall insure against such liability and shall continue such insurance during the whole of the time that any persons are employed by him on the Works. Provided that, in respect of any persons employed by any Subcontractor, the Contractor's obligations to insure as aforesaid under this Sub-Clause shall be satisfied if the Subcontractor shall have insured against the liability in respect of such persons in such manner that the **Employer** is indemnified under the policy, but the Contractor shall require such Subcontractor to produce to the Executing Agency, when required, such policy of insurance and the receipt for the payment for current premium.

#### **22.1.13 Evidence and Terms of Insurance**

The Contractor shall provide evidence to the Executing Agency as soon as practicable after the respective insurance have been taken out but in any case prior to the start of work at the Site that insurance required under the Contract have been effected and shall, within 84 days of the Commencement Date, provide the insurance policies to the **Employer**. When providing such evidence and such policies to the **Employer**, the Contractor shall notify the **Engineer** of so doing. Such insurance policies shall be consistent with the general terms agreed prior to the issue of the Letter of Acceptance. The Contractor shall effect all insurance for which he is responsible with insurers and in terms approved by the Executing Agency.

#### **22.1.14 Adequacy of Insurance**

The Contractor shall notify the insurers of changes in the nature, extent or programme for the execution of the Works and ensure the adequacy of the insurance at all times in accordance with the terms of the Contract and shall, when required, produce to the Executing Agency the insurance policies in force and the receipts for payment of the current premiums.

#### **22.1.15 Remedy on Contractor's Failure to Insure**

If the Contractor fails to effect and keep in force any of the insurance required under the Contract, or fails to provide the policies to Executing Agency within the period required by Sub-Clause 22.1.13, then and in any such case the **Employer** may effect and keep in force any such insurance and pay any premium as may be necessary for that purpose and from time to time deduct the amount so paid from any monies due or to become due to the Contractor, or recover the same as a debt due from the Contractor.

**22.1.16 Compliance with Policy Conditions**

In the event that the Contractor or the **Employer** fails to comply with conditions imposed by the insurance policies effected pursuant to the Contract, each shall indemnify the other against all losses and claims arising from such failure.

The Contractor shall be entitled to place all insurance relating to the Contract (including, but not limited to, the insurance referred to in Clauses 22.1.2 to 22.1.5, 22.1.8 to 22.1.11 and 22.1.13 to .22.1.15) with insurers from India.

**23. Dues not paid by the Contractor**

The contractor shall pay all dues or fees to Statutory authorities and Electric and Water supply authorities etc. within due period and indemnify the Client and the Executing Agency from any claims or compensations or penalties or damages arising out of non-payment of any such dues or fees. However, in case some dues or fees are not paid by him / and or claims for compensations or penalties etc. are raised by the Statutory authorities, the Client may deposit the required amount for any or all of the above and recover or deduct the same from any money payable to the contractor by the Client or any other means available to the Client such as bank guarantee.

**24. Billing & Certification**

- a) The Engineer-in-Charge may at any time make any corrections or modifications to any certificate, which shall have been issued by him and shall have power to withhold any certificate if the Works or any parts thereof are not being carried out to his satisfaction.
- b) The responsibility for making the payments or meeting other obligations to the Contractor in respect of all Works as certified by the Engineer-in-charge shall be that of the Client and not of the Executing Agency.
- c) After completion of work and prior to final payment, the contractor shall furnish to the engineer, a release of claim against the Employer arising out of contract, other than claims specifically identified, evaluated and excepted from the operation of the release by contractor.
- d) Contractor has to submit break up of BOQ rate to facilitate approval of interim payment by the Engineer. However final decision on break up of rates/ part rates to be paid in parts will be taken by Engineer.
- e) Contractor shall submit monthly running bills in format approved by the Engineer-in-charge for executed works and materials for which secured advance is desired along with required details and measurements as directed by the Executing Agency. Monthly bill not submitted in approved formats will not be accepted.

**25. Urgent Repairs**

If, by reason of any accident, or failure, or other event occurring to or in connection with the works, or any part thereof, either during the execution of the works, or during period of Defects Liability any remedial or other work or repair, shall, in the opinion of the Engineer-in-charge/Executing Agency/Client be urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work or repair, the Engineer-in-charge/Executing Agency may employ and pay other persons to carry out such work or repair as the case may be and may consider necessary. If the work or repair so done by the other agency is the work which, in the opinion of the Engineer-in-charge/Executing Agency the Contractor was liable to do at his own expense under the Contract, all expenses incurred by Other agency in so doing shall be recoverable from the Contractor by the Engineer-in-charge/Executing Agency, or may be deducted by the Engineer-in-charge/Executing Agency from any monies due or which may become due to Contractor.

**26. Boreholes & Exploratory Excavation**

If, at any time during the execution of the Works, the Executing Agency shall require the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be ordered in writing and shall be deemed to be an additional ordered under the provisions unless a provisional sum in respect of such anticipated work shall have been included in the schedule of items.

**27. Fossils, Etc.**

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the works shall be the property of the Government.

**28. Plant Temporary Works & Materials**

(a) Plant, etc. Exclusive use for the Works

All Constructional Plant, Temporary Works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof except for the purpose of moving it from one part of the Site to another, without the consent, in writing of the Executing Agency, which shall not be unreasonably withheld.

(b) Removal of Plant etc.

Upon completion of the Works, the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor, within 10 days of obtaining the completion certificate.



## 29. Reports by Contractor

- (a) The contractor shall maintain daily weather record. Daily maximum and minimum temperature and corresponding, humidity shall be recorded and charted. Rainy days shall be recorded when the rain lasting more than one hour hampers the work. Any other inclemency in weather shall be recorded. The records shall be regularly shown to the Executing Agency and his signature obtained.
- (b) The Contractor shall file daily category-wise labour report to the Engineer-in-charge/Executing Agency. The report shall indicate scheduled requirement against actual strength.
- (c) The Contractor shall prepare Weekly Reports of planned and actual progress of work and subsequent week's scheduled work. These will also include material procurement status. These reports shall be submitted to the Executing Agency & shall be reviewed in Weekly Co-ordination Meetings.
- (d) The Contractor shall submit Monthly Progress Report as per format approved by Engineer-in-charge/Executing Agency along with monthly bills.
- (e) The Contractor as directed by the Engineer-in-charge/Executing Agency shall prepare further Progress Charts and Schedules.

30. Every care has been made to include all the aspects/ terms and condition in these documents. However, during execution, any issue arises, which has not been included in these documents, norms/ rules & regulations/ terms & conditions as prevalent in CPWD shall be followed.

## 31. Miscellaneous

### 1. Monthly Progress Photographs

The Contractor shall arrange at his own cost to maintain a progress record of the works by taking 5x7 inch size colour photographs (preferably digitized photographs) minimum 6 Nos. photographs or more per week alongwith soft copy of photographs in CD or as directed by the Executing Agency during the constructions stages and after completion and shall supply one set to the Client and one set to the Executing Agency at no extra cost. These photographs shall also be submitted as part of the Contractors R.A. Bills. The Contractor will be required to submit monthly reports on the progress of his work as per the format approved by the Engineer-in-charge/Executing Agency.

### 2. By-Laws of Statutory Authorities

The Contractor and his labour shall not violate municipal/sanitation/health or any other byelaws.

3. Tax Deduction at Source

Taxes and surcharge as applicable, shall be deducted from the amount paid to the Contractor towards the value of the work done. The amount so deducted at source, shall be deposited into Government Treasury and a certificate thereof shall be issued to the Contractor.

4. Definition of “and”, “or”, “and/or”

The terms “and”, “or”, “and/or” used in the context with the description or enumeration of two or more items or components of work or documentation or anything similar shall mean as is relevant and applicable to the text.

5. Delay in starting the work

No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land, encroachment or in the case of clearance of works, on account of any delay in according sanction to estimates in issue of drawings, decisions etc. However, the extension of time shall be granted as per relevant conditions of Contract.

6. Technical Examination

The Client shall have the right to cause Audit and Technical Examination of the works and the final bills of the contractor including all supporting vouchers, abstracts, etc. to be made as per payments of the final bill and if as a result of such Audit and Technical Examination the sum is found to have been overpaid in respect of any work done by the contractor under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over payment and it shall be lawful for the Client/ Engineer-in-charge/Executing Agency to recover the same from the security deposit or Performance Security of the contractor or from any dues payable to the contractor. If it is found that the contractor was paid less than what was due to him under the contractor in respect of any work executed by him under it, the amount of such under payment shall be duly paid. The work comes under the purview of CVC and as such all orders and instructions are applicable to this work.

In the case of any audit examination and recovery consequent on the same the contractor shall be given an opportunity to explain his case and the decision of the Client shall be final. Payment on this account will be recovered from the contractor.

In the case of Technical Audit, consequent on which there is a recovery from the contractor, recovery should be made with orders of the Client whose decision shall be final. All action under this clause should be initiated and intimated to the contractor within the period of twelve months from the date of completion.

7. Site instruction book

For the purpose of quick communication between Engineer-in-charge/Executing Agency and the Contractor or his representative, site instruction book shall be maintained at site as described below:

Any communication, relating the works may be conveyed through records in the site instruction book. Such a communication from Executing Agency to the Contractor shall be deemed to have been adequately served in terms of the contract. Such site instruction book shall have machine numbered pages in triplicate and shall be carefully maintained and preserved by the Contractor and shall be made available to Engineer-in-charge/Executing Agency and Client as and when demanded. Any instruction which Engineer-in-charge/Executing Agency may like to issue to the Contractor may be recorded by the Engineer-in-charge/Executing Agency in site instruction book and two copies thereof taken by the Executing Agency for his record.

8. Signage

With prior approval of the Executing Agency, the Contractor shall provide at his own cost, a sign board at directed location of overall size 2 meters by 4 meters indicating name of the project, and a three-D view of the project, as approved by the Executing Agency. The signboard will be illuminated during night.

9. Cutting of Trees

Permission of cutting of trees if required will be obtained by Contractor.

10. Other Miscellaneous:-

- (i) All concrete work shall be strictly done by weigh batcher/RMC. However, no extra payment shall be made for use of Ready Mix Concrete (RMC) for the works. Modern concrete pump and vibration machines, constructions lift, tower crane, etc, as required are also required to be provided at site as and when required.
- (ii) All shuttering material to be used at site will be new/just like new and only ply & steel plate will be allowed to be used as directed by Engineer-in-charge/Executing Agency. Only steel props will be used at site and no wooden balli etc will be permitted.

- (iii) The contractor shall have adequate generators of required capacity as per site requirement as stand by arrangement.
- (iv) The temporary connection for electric line and water line from local authorities shall be taken by the contractor who will bear the expenditures
- (v) Any dispute arising due to typing mistakes/ omissions in the document the decision of the Client will be final
- (vi) Deleted
- (vii) Unless otherwise mentioned in the bill of quantities the measurements of works shall be done as per given specifications (as specified in Technical Specification of the Tender) and if the same is not given in the specification, the same shall be measured as per CPWD Specifications or latest relevant BIS codes in force.
- (viii) No idling charges or compensation shall be paid for idling of the contractor's labour, staff or P&M etc. on any ground or due to any reason whatsoever.
- (ix) Contractor shall mobilize and employ sufficient resources for completion of all the works as indicated in the agreed Bar Chart/ Network. No additional payment will be made to the contractor for any multiple shift work or other incentive methods contemplated by him in his work schedule even though the time schedule is approved by Engineer-in-charge/Executing Agency.
- (x) Steel conforming to BIS specifications (latest edition) shall be procured from as per approved list by the client by the contractor directly from manufacturers. The manufacturer has to give a certificate that the material supplied is not a re-rolled product. Relevant vouchers & test certificates will be produced by the contractor. Re-rolled sections will not be allowed. Reinforcement steel, structural steel shall be stored and stacked in such manner so as to facilitate easy identification, removal etc. The contractor shall take proper care to prevent direct contact between the steel and the ground/ water for which he shall provide necessary arrangement at his own cost including ensuring proper drainage of area to prevent water logging as per directions of the Engineer-in-charge/Executing Agency. Steel shall also be protected, by applying a coat of neat cement slurry over the bars for which no extra payment shall be made. Test certificates for each consignment of steel shall be furnished and tests to be got carried out from the authorized laboratory as per the directions of Executing Agency, before incorporating the materials in the work.

- (xi) Water proof plywood only or steel plates of minimum thickness as approved by Executing Agency shall be used for formwork. The shuttering plates shall be cleaned and oiled after every repetition and shall be used only after obtaining approval of Executing Agency's Engineers at site. The number of repetitions allowed for plywood and steel shuttering shall be at the discretion of Engineer-in-charge/Executing Agency depending upon the condition of shuttering surface after each use and the decision of Engineer-in-charge/Executing Agency in this regard shall be final and binding on the contractor. No claim whatsoever on this account shall be admissible.
- (xii) RECORDS OF CONSUMPTION OF CEMENT & STEEL - For the purpose of keeping a record of cement and steel received at site and consumed in works, the contractor shall maintain a properly bound register in the form approved by the Executing Agency, showing columns like quantity received and used in work and balance in hand etc. The contractor's representative shall sign this register daily.
- (xiii) The register of cement & steel shall be kept at site in the safe custody of Executing Agency during progress of the work. This provision will not, however, absolve the contractor from the quality of the final product.
- (xiv) To ensure that the services under the scope of this contract are in accordance with the specifications, the Contractor shall adopt Quality Assurance Programme to control such activities at the necessary points. The contractor shall prepare and finalize such Quality Assurance Programme within 15 days from letter of intent. Executing Agency shall also carryout quality audit and quality surveillance of systems and procedures of Contractor's quality control activities. A Quality Assurance Programme of Contractor shall generally cover the following:
- a) Procedure for selection and approval of material sources.
  - b) Type, frequency, sampling and procedure of tests at site and laboratories.
  - c) Work instruction for various stages of work.
  - d) Formats for carrying out various tests.
  - e) Checklist for Construction Practices.

The instruction, approvals are given by the Executing Agency to contractor shall hold good till the same not objected by client. In case instructions and approvals are given by client, the same shall supersede the instruction of Executing Agency. In all case decision of Client shall be final and binding for contractor.

- (xviii) The contractor shall co-operate with other agencies working in the same project, compare plans, specifications and the time schedules and so

arrange his work that there will be no interference. The Contractor shall forward to the Executing Agency all correspondences and drawings exchanged. Failure to check plans for conditions will render the Contractor responsible for bearing the cost of any subsequent change found necessary or damages done.

However, the Contractor shall afford necessary facilities to execute the work simultaneously with other agencies executing the works for the same project. The Client/ Engineer-in-charge/Executing Agency shall entertain no claim on this account.

### **32.0 Co-ordination Meeting**

The Contractor shall be required to attend co-ordination meetings with the Engineer, the Executing Agency and the other Contractors during the period of Contract as instructed by the Engineer. All costs incidental to such interaction shall be to the Contractor's account and no claim will be entertained by the Employer/Engineer on this account.

### **32.1 Site Development**

- a) Proper arrangement of security, safety, transportation, manpower, lighting arrangement to be maintained during execution of works at night.
- b) For rapid execution of work, contractor has to arrange their own batching plant and others machinery, tools and tackles needed for the work.
- c) For diversion of under ground services proper arrangement to be made by the contractor with the approval of Engineer.

### **32.2 Contractor's Working Area**

Suitable working area will be provided by the Engineer to the Contractor. The Contractor may have to carry out some cutting / filling work for making his working area. The cost of all such Works shall be deemed to have been included in the rates and prices quoted for the Works and no extra payment shall be made on this account.

### **32.3 Contractor's Temporary Structures**

The Contractor may, at his own expense and subject to the approval of the Engineer and statutory authorities, construct offices, stores, Workshop in the area allocated to him and remove the same as per the orders of the Engineer on completion of Works. The Contractor shall furnish such details of his Temporary

Works as may be called for by the Engineer and the Contractor shall satisfy the Engineer as to their safety and efficiency. Engineer may direct those Temporary work which he considers unsafe or inefficient be removed and replaced in a satisfactory manner. The Contractor shall immediately follow Engineer's directions/ instructions.

The Contractor shall make his own arrangement at his own expense for labour camp / accommodation of his labour and staff and their conveyance to Site as no workers/ staff shall unless with the specific approval of the Engineer be allowed to stay within the Site. Gate passes shall be issued by the Engineer to authorise the Contractor's staff and workers to enter the Site.

#### 32.4 Procurement of Various Materials

The Employer will not supply any construction materials required for the Works under this Contract. The Contractor must, therefore, make his own arrangements for timely procurement of various materials including steel and cement. Prior approval of each and every material including steel cement, aggregate, bricks etc or any other fittings & fixtures to be taken from engineer before its procurement to site. However in case of excessive delay in procurement of various materials, the engineer may also take decision of procurement of material directly and the cost will be recovered from the contractor.

#### 32.5 Water Supply & Power Supply

The Contractor shall make his own arrangement for water supply at Site for drinking as well as construction purposes at his own cost. The Contractor shall also make his own arrangements for power supply at Site for construction, testing & commissioning of all services and general use at his own cost.

Non-availability of power supply and/or water from whatever source shall not entail any additional claims or extension of Contract period in this account. The contractor will provide water & electricity to the Engineer's office free of cost for the required quantity by the engineer's site office.

#### 32.6 Site office and Infrastructure

A reasonably furnished site office and transit accommodation having a sample room, A.C. meeting room, A.C. staff rooms with file storage facility along with computers & printers and its consumables, a telephone with STD facility, Fax Machine, internet and toilets & pantry and a vehicle (Swift Dzire or equivalent) complete with driver, fuel and consumables shall be provided for Executing agency/HSCC by the Contractor at his own cost for the duration of the Contract.

Electricity & drinking water for the site office will have to be provided by the contractor at his own cost for the site office.

In case suitable existing building/accommodation is available at site, the same may be furnished as above with the consent of the Executing Agency.

### 32.7 Temporary Fencing

The Contractor shall at his own expense, erect and maintain in good condition temporary fences all around the working premises as per approved specifications by Engineer. After the successful completion of work all the temporary fencing will be dismantled/removed by contractor and all the dismantled/removed material from here shall be the property of the contractor. The Contractor shall also erect and maintain suitable metal frame fencing around the slab openings, cut-outs/lift wells/stairwells/shaft etc.

### 32.8 Mix Design of Concrete

The contractor shall carry out the mix design for the relevant item of concrete from a reputed institution/laboratories as approved by Engineer at his own expenses within 15 days from notification of award. Prior approval of engineer is to be taken before the samples (Cement, Coarse & fine aggregates) sent to the Institution for Mix design. The decision of engineer shall be final and binding for above. The design mix required may with or without admixtures.

### 33.0 Compliance of Statutory Obligations for obtaining completion Certificates:

The Contractor shall comply all the statutory obligations and obtain all required clearances to implement the project without any financial repercussions to Executing Agency /Employer and ensure all follow up actions with the local authorities in this respect for smooth completion of the project. All statutory charges to get any NOC, clearances from local authorities to be obtained by the contractor and the charges towards the NOC shall be reimbursed after submitting the bills/documentary evidences along with RA bills/final bill. The contractor is required to obtain all NOC, completion & Occupancy certificates from the respective local bodies as applicable:

### 34.0 Rates/Prices

The quoted rates/prices for the items shall be complete in all respect including all labour, material, plant and machinery, tools and tackles, batching plant for RCC work including water & electricity, all taxes including GST/Service Tax, duties, levies, octroi, statutory levies applicable from time to time and others as specified in SCC etc. The contractors attention is invited towards different floor finish and their respective finish levels as indicated in architectural drawings, and nothing extra will be payable for additional mortar bed required to achieve uniform



finished levels. The Contractor should quote his rates/prices accordingly for the complete items in all respects.

**35.0 Cash Flow targets**

The contractor shall provide in writing one month in advance the detailed arrangements of funds to meet the financial targets for the next months.

**36.0 Arbitration**

The venue/ seat of Arbitration shall be at Delhi.

During the arbitration the contractor shall not stop the work & shall continue to work in terms of the contract.

37. The entire works will be liable to be inspected by Chief Technical Examiner i.e. CTE /CVC and ISO auditors. The Contractor will provide all necessary help required for in this connection. The Contractor will have to comply with the procedures/observations/ suggestions of the CTE/ISO in respect of quality, specifications, and workmanship in his scope of work, if any. No extra payment will be made on this account. However, any recovery arising out of the CTE's observation will be borne by the Contractor.

**38. Separate bank Account**

The contractor shall open a bank account specifically for this contract. The mobilization advance given to the contractor shall be deposited in this account only. The details of this account shall be made available to the Executing agency. The contractor shall draw from this account the expenses for the purpose of procurement of materials, machineries, tools & plants and shuttering required for the said work only.

## **ADDITIONAL SPECIFIC CONDITONS OF CONTRACT**

### **AND**

## **SPECIFICATIONS**

### **(A) RELATING TO CIVIL, PLUMBING & FIRE FIGHTING WORKS**

#### **1.0 General**

1.1 The following Additional Specific Conditions and specification shall be read in conjunction with General Conditions of Contract and Specific Conditions of Contract. If there are any provisions in these Additional Specific Conditions which are at variance with the provisions in the above mentioned documents, the provisions in these Additional Specific Conditions shall take precedence.

1.2 These additional specific conditions and specification shall be considered as an extension and not as a limitation of obligation of the preference.

\* The CPWD General Specification for Electrical works: Part V Down Comer System for fire fighting-latest issue. Termination used in the bid shall also be accordance with CPWD.

\* For items not covered in CPWD Specification, the work shall be done as per the latest relevant IS Code of practice.

\* For item not covered by any of the above the installation shall be done as directed by the Engineer and as per sound engineering practices.

**2.0** The Contractor shall make provision of hangers, sleeves, structural openings and other requirements well in advance to hold up progress of the construction schedule.

2.4 The said Contract comprises of furnishing of all materials, equipment, labour & transportation etc. necessary to render the installation fully operational as per the intent of specification and drawings, including any necessary adjustment or corrections. The installation shall be all in conformity with local laws covering such installation.

#### **3.0 Contract Drawings**

3.1 The drawings issued with the Bid are diagrammatic only and indicate the extent and general arrangement of the installation. Drawings shall not be scaled.

3.2 The Contractor shall follow the Bid drawings for preparation of his detailed sanitary, plumbing & Shop drawings and for subsequent installation work. He shall check the drawings of other services to verify spaces in which his work will be installed. The Contractor shall examine all Architectural, Structural, Plumbing and other services drawings before starting the work and report to the Engineer any discrepancies and obtain clarification. Any changes found essential to coordinate installation of this work with other services, shall be made with prior approval of the Engineer.

4.0 All shop drawings and detail drawings will be made as per requirements of local authorities and tender drawings incorporating all latest regulations and requirements. No separate drawings will be, issued for making shop drawings.

## 5.0 Inspection and Testing

5.1 The Engineer reserves the right to request inspection and testing at manufacturer's Works at all reasonable times during manufacture of items for this Contract.

5.2 The Engineer or his authorised representative shall have full power to inspect the materials and workmanship at the Contractor's Works or at any place from which the materials or equipment is obtained. Acceptance by the Engineer of any material or equipment shall in no way relieve the Contractor of his responsibility for meeting the requirements of the specifications. All incident expenditure like travelling, boarding and lodging etc shall be born by the contractor.

5.3 Routine and typical tests for the various items of equipment shall be performed at the Contractor's Works and test certificates furnished.

If required by the Engineer, the Contractor shall permit the authorised representative of the Engineer to be present during any of the tests.

5.4 After installation has been virtually completed, the Contractor shall carry out under the direction and in the presence of the representative of the Engineer such tests and inspections as have been specified, or as the representative shall consider necessary to determine whether or not the full intent of the requirements of the drawings and specifications have been fulfilled. In case the work does not meet the full intent of the drawings and specifications and further tests are considered necessary, the Contractor shall carry them out and bear the expenses thereof.

5.5 The Contractor shall provide all necessary instruments such as Theodolite, Dumpy level, steel tapes, weighing machine, plumb bobs, spirit levels, hammers, micrometers, thermometers, hydraulic testing machine, smoke test machine and labour for testing. The Contractor shall make adequate records of the test procedures and readings, shall repeat any tests requested by the Engineer and

shall provide test certificates signed by an properly authorised person. Such test certificates shall cover all Works. All such equipments shall be tested for calibration at any approved laboratory.

5.6 If test fail to demonstrate the satisfactory nature of the installation or any part thereof, then no claims for the extra cost of modifications, replacement or retesting will be considered. The decision of the Engineer shall be regarded as final as to what constitutes a satisfactory test.

5.7 The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere.

## **6.0 Test Certificates**

The contractor shall submit test certificates for all the materials / systems. These shall be issued by a government recognized inspection office certifying that all Equipment, Materials, Construction and function are in agreement with the requirements of these specification and accepted standards.

## **7.0 Performance Guarantee**

7.1 It is clearly understood that the specifications, drawings, schedule of quantities for fire fighting system are for bidder's guidance only. The bidder shall carry out necessary calculation and provide alternative equipment required to achieve the specified level of fire fighting required for human safety. Complete sets of Architectural Drawings are available at site in the Engineer's office and reference may be made to these drawings as required for calculations or for other details. The contractor shall also guarantee that performance of various equipments, individually, shall not be less than, the quoted ratings.

## **8.0 Quiet Operation and Vibration**

8.1 All equipment shall operate under all conditions of load without any sound or vibration, which is objectionable in the opinion of the Engineer. In case of rotating machinery, sound or vibration noticeable outside the room in which it is installed or annoyingly noticeable inside its own room, shall be considered objectionable. Such conditions shall be corrected by the Contractor at his own expense.

## **9.0 Accessibility**

9.1 The Contractor shall locate all equipment, which must be serviced, operated or maintained in fully accessible positions. The exact location and size of access panels, required for each valve or other devices requiring attendance, shall be

finalised and communicated well in time, to be provided in the normal course of work, failing this, the Contractor shall make all the necessary repairs and changes at his own expense.

## **10.0 Electrical Installation**

10.1 The electrical installation shall be in total conformity with the control wiring drawings prepared by the Contractor and approved by the Engineer & shall be connected and tested in the presence of an authorised representative of the Contractor and of the Engineer.

10.2 It is to be clearly understood that the final responsibility for the sufficiency, adequacy and conformity to the Contract requirements of the electrical installation work lies solely with the Contractor.

## **11.0 Completion Drawings**

11.1 At the completion of the work in all respects, the Contractor shall at his own cost submit to the Engineer 4 (four) sets of layout drawings drawn at the approved scale indicating the installation. These drawings shall clearly indicate the complete plant layouts, and piping layouts, location wiring, exact location of all the concealed piping, valves, controls, wiring and other services. The Contractor shall also submit 4(four) sets of consolidated control diagrams, technical literature on all automatic controls and complete technical literature on all equipment and materials. The Contractor shall frame under glass, in the plant room all consolidated control diagrams and all piping diagrams.

## **12.0 Reference Points**

12.1 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of Works.

12.2 All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings.

## **13.0 License and Permits**

13.1 Contractor shall hold a valid plumbing/electrical/HVAC license issued by the Municipal Authority or other competent authority under whose jurisdiction the work falls.

## **14.0 Cutting and Making Good**

14.1 No structural member shall be chased or cut without the written permission of the Engineer.

## **B) RELATING TO ELECTRICAL INSTALLATIONS**

### **1.0 General**

- 1.1 The following Additional Specific Conditions shall be read in conjunction with General Conditions of Contract and Specific Conditions of Contract. If there are any provisions in these Additional Specific Conditions which are at variance with the provisions in the above mentioned documents, the provisions in these Additional Specific Conditions shall take precedence.

### **2.0 Regulations and Standards**

- 2.1 The installations shall conform in all respects to Indian Standard Code of Practice for Electrical Wiring Installation IS : 732-1989 and as per latest CPWD General Specification for Electrical Works (Part I, II & IV). It shall also be in conformity with the current Indian Electricity Rules and regulations in so far as these are applicable to the installations. Wherever these Additional Specific Conditions calls for a higher standard of material and/or workmanship than those required by any of the above regulations, then this Additional Specific Conditions shall take precedence over the said Regulation and Standards. External works & fire detection & alarm system works to be done as per CPWD specification & relevant IS codes.

### **3.0 Rates**

- 3.1 The rates bided shall be for complete items of work inclusive of all taxes, statutory charges and all other charges for items contingent to the work, such as, packing, forwarding, insurance, freight and delivery at Site for the materials to be supplied by the Contractor, watch and ward of all materials for the Internal & external, Electrical Installation testing & commissioning work including water & power for successful installation, testing & commissioning work at Site etc.

### **4.0 Completeness of Bid**

- 4.1 All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections as required, and all other sundry items which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the Bid rates and prices, whether such items are specifically mentioned in the Bid documents or not.

## **5.0 Works to be done by the Contractor**

- 5.1 Unless and otherwise mentioned in the Bid documents, the following works shall be done by the Contractor, and therefore their cost shall be deemed to be included in their rates and prices:
- i. Foundations for equipments and components where required, including foundation bolts
  - ii. Cutting and making good all damages caused during installation and restoring the same to their original finish
  - iii. Sealing of all floor openings provided by him for pipes and cables, from fire safety point of view, after laying of the same
  - iv. Painting at site of all exposed metal surfaces of the installation other than pre-painted items like fittings, fans, switchgear/ distribution gear items, cubicle switch board etc. and erection, shall however be rectified to the satisfaction of the Engineer
  - v. Testing and commissioning of complete installation

## **6.0 Tools for Handling and Erection**

- 6.1 All tools and tackles required for handling of equipments and materials at Site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the Contractor.

## **7.0 Terminology & Scope**

- 7.1 Terminology & scope for this project shall be as per CPWD Specification for Electrical Works (Part I - Internal) - latest & External Works - Part II - latest.

### **7.2 Measurement**

Measurement shall be as per CPWD specifications Part – I ( Internal ) & Part - II ( External) unless otherwise specified in the technical specifications / BOQ.

## **8.0 Drawings**

- 8.1 The drawings indicate the extent and general arrangements of the fixtures, controlling switches, wiring system etc. and are essentially diagrammatic. The drawings indicate the points of termination of conduit runs and broadly suggest the routes to be followed. The Contractor shall submit six sets of working electrical drawings based on tender drawing including reflected ceiling plan coordinating other essential building services for the Executing Agency's

approval. Contractor has to make necessary changes if any as per comments given by Executing Agency before execution. The work shall be executed as indicated in the approved drawings, however any minor changes found essential to co-ordinate the installation of this work with the other trades shall be made without any additional cost of owner. The drawings are for guidance of the contractor and exact locations, distance and levels shall be governed by the building. The Contractor shall examine all architectural, structural, plumbing and sanitary & electrical drawings before starting the work and report to the Engineer any discrepancies, which in his opinion appear on them and get it clarified. Contractor shall not be entitled to any extras for omissions or defects in electrical drawings or when they conflict with other services work.

## **9.0 Conduit/ Trunking Layout**

- 9.1 Prior to the laying of the conduits and trunking, the Contractor shall examine/ study drawings and report to Engineer in case he desires to make any changes from Executing Agency proposed conduit layout plan and shall get the same approved from Executing Agency.

## **10.0 Shop Drawings**

- 10.1 The Contractor shall prepare and submit to the Engineer for his approval detail shop drawings of Main & Sub Distribution Boards, Distribution Boards, special pull boxes, light & fan switch boards, telephone distribution boards, FDA system and lightning protection system and other equipment to be procured/ fabrication by the Contractor within 15 days of signing of the above items required to complete the electrical installation in all respect.

## **11.0 Manufacturer's Instruction**

- 11.1 Where manufacturers' have furnished specific instructions, relating to the materials used in this job, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases.

## **12.0 Materials & Equipment**

- 12.1 All materials and equipment shall be ISI marked and shall be of the approved make and design. Unless otherwise called for, only the best quality of materials and equipment shall be used. The Contractor shall be responsible for the safe custody of all materials till these are taken over by client and shall insure as against theft, damage by fire, earth quake etc. A list of items of materials and equipment, together with a sample of each shall be submitted to the Site office.

## **13.0 Scale**



13.1 Drawings shall be prepared to the scale as required for proper explanation and shall indicate the size and location of all equipments and accessories herein. The Contractor shall obtain all dimensions preferably at the building (Site of work) and check those plans for interference with the building structure and other equipment.

#### **14.0 Brochures and Data**

14.1 The Contractor shall submit four copies of all brochures / manufacturer's description data and similar literature.

#### **15.0 Approval of Shop Drawings**

15.1 The Engineer's approval of shop drawings, schedule, brochures etc. shall be an approval of general details and arrangements only and shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless he has in writing called Engineer to such deviations at the time of submission nor shall it relieve the Contractor from responsibility for errors or omissions of any kind in the shop drawings when approved.

#### **16.0 Samples & Catalogues**

16.1 For Executing Agency's approval, Contractor shall submit the samples & catalogue of the material, which are used at Site as per the approved makes.

#### **17.0 Approval of Materials**

17.1 All materials used on the Works shall be new and of the best quality available, conforming to the relevant specifications and as per good Engineering practice. Prior approval shall be obtained in writing from the Engineer for all materials proposed and when necessary, approved sample duly identified and labelled shall be deposited with the Engineer and shall be kept at Site. List of approved make indicates make/ manufacturer generally acceptable. Contractor shall submit the detail drawings for Executing Agency's approval.

#### **18.0 Inspection, Testing and Inspection Certificate**

18.1 Executing Agency and authorised representative of Executing Agency shall have at all Reasonable times access to the Contractor's premises or Works and shall have the power at all reasonable time to inspect and examine the materials and workmanship during its manufacture or erection or if the part of works is being manufactured or assembled at other premises or works.

18.2 The Contractor shall arrange all the materials and labour required for inspection of equipment or for any testing to be carried out at his/ manufacturer's works or at Site. Notice for such inspection/ presence for testing shall be given to the

Engineer by the Contractor at least fifteen (15) days in advance together with the routine test certificates of the equipments/ materials given by the manufacturer.

- 18.3 Notwithstanding approval of tests or equipment by the Engineer, the Contractor shall be required to perform site tests and prove the correctness of ratings and performance of equipment/ machinery and materials supplied and installed by the Contractor as per the Contract specifications and conditions. Engineer shall have full power to order the material or work to be tested by an independent agency at the electrical Contractor's expense in order to prove soundness & adequacy.

## **19.0 Schedule & Manner of Operation**

- 19.1 Time being the essence of this Contract, Contractor shall be expected to furnish all labour & material in sufficient quantities at appropriate time, expedite and schedule the work to meet the Engineer's requirement and so manage the operations that the work shall be completed in time as stated else where. In case of shut down of power supply, Contractor shall coordinate with Engineer and shall carry out essential works during the shut down period allowed by the Engineer. In case Engineer allows for such period during night or early morning hours, Contractor shall make all provisions to avail such account. Contractor shall not be entitled for any extra claims on such account. Contractor shall programme his work in such a way that items of work requiring presence of Engineer are carried out between 9 A.M. & 5 P.M. on working days.

## **20.0 Performance Guarantee**

- 20.1 All equipment shall be guaranteed for a minimum period of 12 (Twelve) months from the date of handing over of installation to the Engineer against unsatisfactory performance and/or break down. The equipment or component or any other part of installation so found defective within the guarantee period shall be replaced / repaired by the Contractor free of cost to the satisfaction of the Engineer. The normal guarantee and or warranty provided by the manufacturer will have to be submitted along with all the test certificates from manufacturer.

## **21.0 Conformity with Statutory Acts, Rules and Standards**

- 21.1 The installation shall be in conformity with the Bye-laws, Regulations and Standards of the local authorities applicable to the installations. But if the specifications and drawings call for a higher standard of material and/or workmanship than those required by any of the above Regulations and Standards, then the specifications and drawings shall take precedence over the said regulations and standards.

- 21.2 However, if the drawings or specifications required something which violates the Bye-laws and Regulations, then the Bye-laws and Regulations shall govern the requirement of this installation.
- 21.3 Indian Electricity Act and Rules : All electrical works in connection with installations of the system shall be carried out in accordance with the provision of the Indian Electricity Act, 1910 and the Indian Electricity Rules 1956, both amended upto date.
- 21.4 CPWD Specification :The Electrical installation work shall conform to CPWD General specifications for Electrical Works Part I (Internal) I and Part II (External) latest issues , both amended upto date.
- 21.5 Indian Standard : The system / components shall conform to relevant Indian Standards wherever they exist and to the latest National Building Code-2005.
- 21.6 Nothing in these specifications shall be construed to relieve the Contractor of his responsibility for the design, manufacture and installation of the equipment with all its accessories in accordance with applicable Statutory Regulations and safety codes in force.

## **22.0 Completion Drawings (As Built Drawings)**

- 22.1 On completion of the work and before issue of certificate of virtual completion, the Contractor shall submit to the Engineer completion plan drawn to a scale in tracing cloth with ink indicating the following, along with three blue print copies of the same:
- a. Run and size of conduits, inspection boxes, junction boxes and pulls boxes
  - b. Number of size of conductors in each conduit
  - c. Location and rating of sockets and switches controlling the light and power outlets
  - d. Location and details of main & sub distribution boards, distribution boards indicating the circuit number controlled by them
  - e. Type of fitting viz. fluorescent, pendants, brackets, bulkhead etc., including their rating & type of lamp, fans and exhaust fans
  - f. A complete wiring diagram as installed and schematic drawings showing all connections for the complete electrical system
  - g. Location of telephone outlets, junction boxes and sizes of various conduits and number & sizes of wire drawn

- h. Layout of telephone cables
- i. Location of all earthing stations, route and size of all earthing conductors, manholes etc.
- j. Layout and particulars of cables & sub mains
- k. Schematic drawing for telephone system
- l. Layout of conduits for computer outlet points
- n. Layout and details of lightning protection system
- o. Insulation tests and earth test results
- u. External lighting drawing with road layout

### **23.0 Confirmation of Quantities**

23.1 All quantities indicated in BOQ are tentative which may vary as per site conditions. Contractor has to verify quantities before procuring the material. No payment shall be payable for quantity brought to site but not used.

### **24.0 Terms of Payment (Only for items of major electrical equipments)**

For purposes of estimating the contract value of work executed for certificate of payment under clause 32(d) of section II the following norms shall be followed.

- a. 70% of BOQ rate on receipt of equipment against receipt of complete material at site & test certificates.
- b. 15% of BOQ rate on erection and installation of equipment.
- c. 10% after successful completion of all works including all testing, commissioning & taking over.
- d. 5% after taking over of all works.

### **25.0 Training of Personnel – Deleted**

### **26.0 Completion Certificate**

26.1 On completion of the installation, a certificate shall be furnished to the Engineer, by the Contractor, countersigned by the licensed supervisor under whose direct supervision the installation was carried out. This certificate shall be in the

prescribed form as required by the local authority. On the basis of this certificate, the Contractor shall arrange for inspection of installation by the concerned local authorities.

- 26.2 The Contractor shall be responsible at his own cost for getting the installation duly approved by the authorities concerned.

**27. Testing and Commissioning**

The Contractor shall pay for and arrange without any extra cost, all necessary balancing and testing equipment, instruments, materials, accessories, power, water, fuel and the requisite labour for testing. Any defects in materials and/or in workmanship detected in the course of testing shall be rectified by the Contractor entirely at his own cost, to the satisfaction of the Engineer. The installation shall be tested again after removal of defects and shall be commissioned only after approval by the Engineer. All tests shall be carried out in the presence of the Engineer or the Engineer's representative.

(C) **SPECIFIC CONDITIONS OF CONTRACT RELATING TO HVAC SYSTEM**

**1.0 General**

1.1 The following Additional Specific Conditions shall be read in conjunction with General Conditions of Contract and Specific Conditions of Contract. If there are any provisions in these Additional Specific Conditions which are at variance with the provisions in the above mentioned documents, the provisions in these Additional Specific Conditions shall take precedence.

**2.0 Scope of Contract**

2.1 The scope and general character of works to be carried out under this section comprises of Supply, Installation, Testing and Commissioning of Heating, Ventilation and Air-conditioning installations as illustrated in drawings, specifications, technical data and Bill of Quantities.

**3.0 Stores and Materials**

3.1 The contractor shall provide every thing necessary for the proper execution of the work according to the intent and meaning of the drawings, Bill of quantities and specifications taken together whether the same may or may not be particularly shown or described therein provided that the same can be reasonably inferred there from. In case of any discrepancy in the drawings or between the drawings, Bill of quantities and specification, the more stringent shall be followed. The decision of the Engineer in this regard will be final and complied with.

**4.0 Supply of Equipment**

Equipment shall be strictly as per the list of approved makes/ manufacturers given in the Bid documents. However, final choice of make shall lie with the Engineer.

4.1 The Contractor shall submit manufacturer's test certificates of equipment supplied.

4.2 The Contractor shall submit the original "Excise Paid Certificates", and exit Gate passes form manufacturer's factory/works clearly bearing the batch numbers and date of despatch.

**5.0 Working Drawings etc.**

5.1 The Contractor shall within 60 days of signing of the Contract, prepare and submit to the Engineer for approval, 2 sets of detailed shop drawings of

equipment, equipment characteristics and capacity details of all equipment, accessories and devices etc. as per specifications and as required by the Engineer.

- 5.2 These drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics, and capacity of all items of equipment, as also details of all related items of work by other disciplines.
- 5.3 If the Engineer makes any amendment in the above drawings, the Contractor shall supply two fresh sets of drawings with the amendments duly incorporated, along with the drawings on which corrections were made. After final approval has been obtained from the Engineer, the Contractor shall submit a further six sets of shop drawings for the exclusive use of and retention by the Engineer.
- 5.4 The shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material, to allow Engineer ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to failure to produce shop drawings in time.
- 5.5 Approval rendered on shop drawings shall not be consider as a guarantee of measurement or of building condition. Where drawings are approved, said approval does not mean that drawings have been checked in detail nor does it in any way relieve the contractor from his responsibility of furnishing materials or performing work as required by the contract.

## **6.0 Completion Drawings**

- 6.1 Following "AS BUILT" drawings shall be submitted by the Contractor on completion of the work :
- a. Plant installation drawings giving complete details of the entire equipment including foundations
  - b. Ducting drawings showing all sizes, damper locations and sizes of all air outlets and intakes, for all floors
  - c. Electrical drawings showing cable sizes, equipment capacities, control components and control wiring
  - d. Schematic control drawings giving detailed sequence of operation and notes to explain the operation of the control circuit
  - e. Piping drawings showing all pipe sizes, valves and fittings
  - f. Any other drawings to be supplied as per instructions of the Engineer

The drawings shall be cross checked and approved by the Engineer before acceptance.

## **7.0 Operation and Service Manuals**

7.1 The Contractor shall submit 3 (three) sets of operation and service manuals in respect of the air-conditioning plant including salient details of plant.

Following minimum details shall be furnished:

- i) Detailed equipment data as approved by the Engineer
- ii) Manufacturer's maintenance and operating instruction
- iii) Approved test readings

The Contractor shall also submit 4 (four) sets of technical literature on all automatic controls and complete technical literature on all equipment and materials. The Contractor shall frame under glass, in the Air conditioning plant room all consolidated control diagrams and all piping diagrams.

Coloured Layouts of all electrical lines in A 1 size properly laminated to be fixed at various locations at the time of handing over of building.

## **8.0 Inspection at Contractor's Premises**

8.1 The Engineer and his representatives shall at all reasonable time have free access to the Contractor's premises/works. The Contractor shall give every facility to the Engineer and his representative and necessary help for inspection and examinations and test of the materials and workmanship.

8.2 The Engineer's representative shall have full powers to inspect drawings of any portion of the work or examine the materials and workmanship of the plant at the Contractor's works or at any other place from where the material or equipment is obtained. Acceptance of any material or equipment shall in no way, relieve the Contractor of his responsibility for meeting the requirement of the specifications.

8.3 For Imported screw type water chilling machine manufacturer's factory test certificate would be acceptable in lieu of inspection at manufacturer works.

## **9.0 Subcontracting**

The Contractor may subcontract part of the works with the written approval of the Engineer to any of the approved subcontractors given in the list of approved subcontractors, makes and manufacturers. A single subcontractor shall be appointed for carrying out the entire work of supplying, installation, testing and



commissioning of all the equipment covered under the package. However, the overall responsibility of the Contractor for compliance with the Contract terms does not alter by subcontracting.

## **10.0 Material Submittals**

The Contractor shall submit material & makes submittals for all equipment and machinery for the written approval of the Engineer before placing orders. The material submittals shall comprise of at least the following:

- a. Manufacturer's technical catalogues and brochures giving technical data about performance and other parameters
- b. Manufacturers drawings/ sketches showing construction, dimensional and installation details
- c. Rating charts and performance curves clarifying rating of equipment selected and proposed

## **11.0 Samples and Prototypes**

The Contractor shall submit samples of items such as grilles/ diffusers, valves, controls and/ or any other parts or equipment as required by the Engineer for prior approval in writing before placing the order. The Contractor shall also construct prototype or samples of work as laid down in the Contract or as instructed by the Engineer. Such samples and prototypes after approval shall be retained by the Engineer and shall serve as the standards to be achieved in final construction.

## **12.0 Testing and Commissioning**

12.1 Tests on equipment as called for in the specifications shall be carried out by the Contractor in accordance with the specifications, the relevant Indian Standard Specifications and the relevant Indian and International Standards.

12.2 The initial tests shall include but not be limited to the following:

- a. To operate and check the proper functioning of all electrically operated components viz., compressor motor, pumps, blowers, air handling units, rotating machine, fans, boilers, etc.
- b. To operate and check the proper functioning of all electrical panels, switch gears, safety and other controls
- c. To adjust and balance air, water, steam and gas quantities to provide the designed flow rates by adjusting valves, dampers, diverters etc.

- d. To check the systems against leaks in different circuits, alignment of motor, 'V' Belt adjustments etc.
- e. To check the vibration and noise levels of the equipment
- f. Setting of all control and all such other tests which are essential for smooth functioning of the plant

12.3 The Contractor shall pay for and arrange without any extra cost, all necessary balancing and testing equipment, instruments, materials, accessories, power, water, fuel and the requisite labour for testing. Any defects in materials and/or in workmanship detected in the course of testing shall be rectified by the Contractor entirely at his own cost, to the satisfaction of the Engineer. The installation shall be tested again after removal of defects and shall be commissioned only after approval by the Engineer. All tests shall be carried out in the presence of the Engineer or the Engineer's representative.

### **13.0 Provisional Taking Over**

13.1 After completion of the installation system, the same shall be put to a continuous running test for a period of 2 (two) days. All adjustments should be made prior to this test so that proper conditions/working are achieved during this testing. The test readings shall include items as noted in the Testing Schedules.

The plant will be provisionally taken over after successful completion of the above test and the defects liability period shall commence after provisional taking over of the system.

### **13.2 Final Performance and Capacity Test**

In addition to the above testing, final performance and capacity tests shall be carried out on the equipment as per the "Testing Schedules" during the defects liability period as follows:

- a. Peak summer/ monsoon test during the period from 15th May to 31st July. The installations should be able to maintain the specified inside conditions within the tolerance limits permitted in the Contract.
- b. Peak winter test during the period from 1st December to 15th February. The installations should be able to maintain the specified inside conditions within the tolerance limits permitted in the Contract.

All the arrangements required to make the entire system operational /running ,for the performance test as above, including cost of electricity, manpower, and fuel etc will have to be arranged & paid by the contractor.

**14.0 Operation of Plant**

14.1 After provisional taking over of the plant user/owner shall provide staff for operation. Staff will work under the supervision of the Contractor for proper operation of the plant. This responsibility of the Contractor shall continue till completion of test liabilities with respect to the plant or the maintenance period, which ever ends later.

14.2 The user shall have the right to operate all equipments, if in operating condition, whether or not such equipments, have been accepted as complete and satisfactory. Repairs and alterations shall be made at such time as directed by the Engineer. In special circumstances user may have to use the plant to Air condition some areas even before the completion of whole work. The Contractor shall co-operate fully under such circumstances.

**15.0 Guarantee and Defects Liability Period**

15.1 The guarantee shall be valid for a period of 12 (Twelve) months from the certified date of completion of the project. In case the contractor is not able to carry out the seasonal tests (summer/monsoon & winter) within the certified date of completion, the same can be carried out during defects liability period. If required, the Defects Liability period shall be extended till satisfactory completion of seasonal rates.

**16.0 Measurement of Works**

16.1 All works shall be measured in accordance with the mode of measurement given in the specific sections of the specifications. In case the method of measurement for any item is not clarified in the specifications, the same shall be measured in accordance with the relevant IS standards and CPWD norms.

**17.0 Variation in Quantities**

17.1 The quantities given in the BOQ are for the guidance of the Bidder. The Contractor shall, however, be paid on the basis of actual quantities of works carried out.

**18.0 Maintenance**

18.1 The Contractor shall provide free maintenance for a period of twelve months after testing and commissioning of the installation. The Contractor shall carry out all routine and special maintenance of the plant and attend to any defects that may arise in operation of the plant. Consumable items required during the maintenance, loss of which is not attributable to bad material and/or workmanship will be arranged by the Employer without cost to Contractor.

**19.0 Performance Guarantee**

19.1 The Contractor shall submit a performance guarantee certificate from the approved subcontractor that the system shall maintain the desired parameters within +/- 5 % of the specified parameters who shall also guarantee that the capacity of various components as well as the whole system covered under the scope of work, technical schedules and Bill of Quantities etc. shall not be less than the specified capacities. The guarantee of the specific equipment supplier alone with regard to the performance of the system shall not be acceptable. However, this does not alter the overall responsibility of the Contractor for compliance with the Contract terms and conditions.

**20.0 Painting**

20.1 All equipment and ancillary items such as pipes, supports etc., will be painted in approved manner, using standard colour scheme as approved by the Engineer.

**21.0 Safe Custody and Storage**

21.1 Safe custody of all machinery and equipment supplied by the Contractor shall be his own responsibility till the final taking over by the Employer. He should, therefore, employ sufficient staff for watch and ward at his own expenses. The Employer may, however, allow the Contractor to use any part of the building for temporary storage of his equipment, if such spaces are ready and available.

**22.0 Terms of Payment**

The following norms shall be followed for terms of payment of HVAC equipments & installation:

- A) 70% of BOQ rate shall be paid on receipt of equipment at Site and after inspection and passing on prorata basis
- B) 15% of BOQ rate shall be paid on satisfactory erection and installation of equipment on prorata basis
- C) 10% after successful completion of running tests
- D) 5% after provisional taking over & after final performance -cum-seasonal test to be conducted in summer or monsoon and removal of all defects pointed out during previous tests.

**23.0 Training of Personnel**

The Contractor shall arrange to train the Employer's personnel on the following aspects prior to provisional take over of the plant :

- a) Operation of plant
- b) Gas charging and pumping down of the system
- c) Adjustments of settings for controls and protective devices
- d) Preventive maintenance
- e) Disassembling and assembling of compressor including identification and replacement

#### **24. Handing over & Taking over process**

For handing over & taking over process in addition to clauses specified the following services/works to be complied by the main contractor:

- a) Submission of Guarantees in stamp paper (format approved by Engineer) for all water proofing treatment executed in the works for a period of ten years. If any defects noticed within 10 years from completion of defect liability period the main contractor shall be sole responsible for the defects and same shall be rectified by the main contractor as per information from client within a period of 10 days from the notice.
- b) Rectification of all defects shall be carried out by the main contractor before Handing over/Taking over process.
- c) As built drawings 4 sets for Architectural, Structural, Plumbing, Electrical, HVAC system, Specialised services and others, approved by engineer shall be submitted by the main contractor before handing over & taking over process.
- d) All services/equipments to be run and check before handing over & taking over process as per requirements of employer/principal employer.
- e) Contractor has to arrange water & electricity at their own cost for the purpose of testing of services and equipments. No extra amount shall be payable on account of the same.
- f) Main contractor shall submit catalogues, brochures, operation manual, manufacturer test certificate, Guaranty/Warranty papers, licence etc for all equipments/materials before handing over & taking over process.

**(D) Additional Specific Conditions of Contract relating to Environmental Clearance & “Green Rating of Integrated Habitat Assessment (GRIHA) Rating System” -****Environmental Clearance**

The following provision for the Environmental clearance will have to be adhere to during execution of the project. Nothing extra will be paid on this account, statutory fee only as applicable which shall be reimbursed to the agency on submission of proof of deposition.

- (i) The Contractor will get registered with the project in the name of client with GRIHA for obtaining minimum GRIHA 3 Star Rating.
- (ii) Contractor will also engage consultant/ Specialize agency who will coordinate, prepare reports etc. for obtaining the GRIHA 3 Star Rating.
- (iii) The Contractor will Obtain GRIHA 3 Star Rating Certificate in the name of client form the concerned statutory bodies.
- (iv) All required sanitary and hygienic measures should be in place before starting construction activities and to be maintained throughout the construction phase.
- (v) A first Aid room will be provided in the project both during construction and operation of the project.
- (vi) Adequate drinking water and sanitary facilities should be provided for construction workers at the site. The safe disposal of wastewater and solid wastes generated during the construction phase should be ensured.
- (vii) Provision should be made for the supply of fuel (kerosene or cooking gas); utensils such as pressure cookers etc. to the labourers during construction phase.
- (viii) All the labourers to be engaged for construction should be screened for health and adequately treated before engaging them to work at the site.
- (ix) All the topsoil excavated during construction activities should be stored for use in horticulture / landscape development within the project site.
- (x) Disposal of muck during construction phase should be not create any adverse effect on the neighbouring communities and be disposed taking the necessary precaution for general safety and healthy aspects of people, only in approved sites with the approval of competent authority.
- (xi) Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such materials must be secured so that they should not leach into the ground water.

- (xii) The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to E (P) Rules prescribed for air and noise emission standards.
- (xiii) Vehicles hired for bringing construction materials to the site should be in good condition and should conform to applicable air and noise emission standards and should be operated only during non-peak hours.
- (xiv) Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase.
- (xv) Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September, 1999 and amended as on August, 2003.
- (xvi) Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred.
- (xvii) Adequate measures to reduce air and noise pollution during construction keeping in mind CPCB norms on noise limits.
- (xviii) Provisions should be made for housing of construction labour at appropriate locations on the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project.

### **Green Rating of Integrated Habitat Assessment (GRIHA)**

The building is proposed to be registered for obtaining GRIHA Rating from GRIHA Secretariat under MNRE scheme. The contractor is required to execute the work in a befitting manner to obtain the GRIHA rating.

#### **1. Special conditions for GRIHA rating:-**

- a) The contractor shall prepare scheme for the approval of Engineer-in-charge for obtaining GRIHA rating in the criterions relevant to the execution of work.
- b) The contractor shall plan and execute the work in a manner to preserve and protect the landscape during construction and shall arrange the materials/equipment and follow the procedure as per criterion 2 of the GRIHA rating as applicable.
- c) The contractor shall appoint/engage consultant/ consultancies to provide technical guidance and supervise the work for obtaining GRIHA rating pertaining to the criterion related to the execution of work.
- d) The contractor shall preserve the top soil layer for supporting vegetative growth.
- e) The contractor shall comply with NBC norms on construction safety, health and sanitation as per criterion 8.

- f) The construction activity shall be done in a befitting manner and the contractor shall adopt measures to prevent air pollution at site in compliance with criterion 9 of GRIHA rating as applicable.
- g) The contractor shall comply with all the instructions and schemes for execution of green building.
- h) Noting shall be paid extra for fulfilment of all these conditions for obtaining GRIHA 3-star rating certification as per above conditions. The cost involved in above compliances to be inclusive in the quoted rates.

## **2. Pre-construction Stage**

### **a) Construction Vehicles, Equipment and Machinery**

- \* All vehicles, equipment and machinery to be procured for construction will conform to the relevant Bureau of India Standard (BIS) norms.
- \* Emission from the vehicles must conform to environmental norms.
- \* Dust produced from the vehicular movement and other site activities can be mitigated by sprinkling of water.
- \* Noise limits for construction equipments will not exceed 75 dB(A), measured at one meter from the edge of the equipment in free area, as specified in the Environment Protection Act, 1986, schedule VI part E, as amended on 19th May, 1993. The maximum noise levels near the construction site should be limited to 65 dB (A) Leq (5 min) in project area.

## **3. Construction Stage**

### **a) Construction Wastes Disposal**

- \* The pre-identified dump locations will be a part of solid waste management plan to be prepared by the Contractor in consultation with Engineer-in-charge.
- \* Contractor will get approved the location of disposal site prior to commencement of the excavation on any section of the project location.
- \* Contractor will ensure that any spoils of material will not be disposed off in any municipality solid waste collection bins.

### **b) Procurement of Construction Materials**

- \* All vehicles delivering construction materials to the site will be covered to avoid spillage of materials and maintain cleanliness of the roads.
- \* Wheel Types of all vehicles used by of the contractor, or any of his sub contractor or materials supplies will be cleaned and washed clear of all dust/mud before leaving the project premises.
- \* Contractor will arrange for regular water sprinkling at least twice a day (i.e. morning and evening) for dust suppression of the construction sites and unpaved roads used by his construction vehicles.

### **c) Pollution**

#### **i) Water Pollution**



- \* The Contractor will take all precautionary measures to prevent the wastewater during construction to accumulate anywhere.
- \* The wastewater arising from the project is to be disposed off in the manner that is acceptable to the Engineer-in-charge.

#### d) Air and Noise Pollution

- \* Contractor will use dust screens and sprinkle water around the construction site to arrest spreading of dust in the air and surrounding areas.
- \* Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that emission levels comply with environmental emission standards/norms.
- \* For controlling the noise from Vehicles, Plants and Equipments, the Contractor will confirm the following:

- i) All vehicles and equipment used in construction will be fitted with exhaust silencers.
- ii) Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced.
- iii) Noise emission from compactors (rollers) front loaders, concrete mixers, cranes (movable), vibrators and saws should be less than 75 dB(A).
- iv) As per the standards/guidelines for control of Noise Pollution from Stationary Diesel Generator (DG) sets, noise emission in dB(A) from DG Set (15-500 KVA) should be less than  $94+10 \log_{10}(\text{KVA})$ . The standards also suggest construction of acoustic enclosure around the DG Set and provision of proper exhaust muffler with insertion loss of minimum 25 dB(A) as mandatory.

#### 4. The following provisions shall be maintained by the contractor at site:-

- 4.1 Provide minimum level of sanitation/safety facilities for construction workers to Ensure the health and safety of the workers during construction, with effective provisions for the basic facilities such as sanitation, drinking water and safety equipments or machinery.
  - i) All the workers should be wearing helmet and shoes all the time on site.
  - ii) Masks and gloves should be worn whenever and wherever required.
  - iii) Adequate drinking water facility should be provided at site, adequate number of decentralized latrines and urinals to be provided for construction workers.
  - iv) Full time workers residing on site should be provided with clean and adequate temporary hutment. Crèche/Day-care facility should be provided to young children of labourers residing on site. First aid facility should also be provided.
  - v) Overhead lifting of heavy materials should be avoided. Barrow wheel and hand-lift boxes should be used to transport materials onsite. Tobacco and cigarette smoking should be prohibited onsite.
  - vi) All dangerous parts of machinery are well guarded and all precautions for working on machinery are taken.

- vii) Maintain hoists and lifts, lifting machines, chains, ropes and other lifting tackles in good condition.
  - viii) Use of durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
  - ix) Ensure that walking surfaces or boards at height are of sound construction and are provided with safety rails and belts. Provide protective equipments such as helmets.
  - x) Provide measure to prevent fire. Fire extinguisher and buckets of sand to be provided in fire-prone area and elsewhere.
  - xi) Provide sufficient and suitable light for working during night.
  - xii) Ensure that measures to protect workers from materials of construction, transportation, storage and other dangers and health hazards are taken.
  - xiii) Ensure that the construction firm/division/company have sound safety policies.
  - xiv) Comply with the safety procedure, norms and guidelines (as applicable) as outlined in NBC 2005 (BIS 2005c).
  - xv) Adopt additional best practices and prescribed norms as in NBC 2005 (BIS 2005).
- 4.2 Identify roads on-site that would be used for vehicular traffic. Update vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral type that make up the surface base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075mm) to 10-20%. Limit vehicular speed on site 10km/h.
- 4.3 All material storages should be adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust/particulate emissions.
- 4.4 Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained/cleaned up immediately before they can infiltrate into the soil/ground or runoff in nearby areas.
- 4.5 Ensure on:
- i) Any dusty material.
  - ii) Areas where demolition work is carried out. Any
  - iii) Unpaved main road and.
  - iv) Areas where excavation or earth moving activities are to be carried out.
- 4.6 The contractor shall ensure the following:
- i) Cover and enclose the site by providing dust screen, sheeting or netting to scaffold along the perimeter of a building.
  - ii) Covering stockpiles of dusty material with impervious sheeting.
  - iii) Covering dusty load on vehicles by impervious sheeting before they leave the site.
  - iv) Transferring, handling/storing dry loose materials like bulk cement and dry pulverized fly ash inside a totally enclosed system.
  - v) Spills of dirt or dusty materials will be cleaned up promptly so that the spilled material does not become a source of fugitive dust and also to prevent seepage of

pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained/cleaned up immediately before they can infiltrate into the soil/ground or runoff in nearby areas.

vi) Clear vegetation only from areas where work will start right away.

vii) Vegetate/mulch areas where vehicles do not ply.

viii) Apply gravel/landscaping rock to the areas where mulching/paving is impractical

4.7 Adopt measures to prevent air pollution in the vicinity of the site due to construction activities.

There is no standard reference for this. The best practices should be followed (as adopted from international best practice documents and codes).

4.8 Provide hoardings of not less than 3m height along the site boundary, next to a road or other public area.

4.9 The contractor will provide experienced personnel with suitable training to ensure that these methods are implemented. Prior to the commencement of any work, the method of working, plant equipment and air pollution control system to be used on-site should be made available for the inspection and approval of the Engineer-in-Charge to ensure that these are suitable for the project.

4.10 Employ measures to segregate the waste on-site into inert, chemical or hazardous wastes. Recycle the unused chemical/hazardous wastes such as oil, paint, batteries and asbestos. The inert waste is to be disposed off to Municipal Corporation/local bodies dump yard and landfill sites.

4.11 Preserve and protect landscape during construction Following provisions shall be made at site by the contractor to preserve and protect landscape. Nothing shall be paid on this account unless specifically provided for in the BOQ. To preserve the existing landscape and protect it from degradation during the process of construction. Select proper timing for construction activity to minimize the disturbance such as soil pollution due to spilling of the construction material and its mixing with rainwater. The construction management plan including soil erosion control management plan shall be

prepared accordingly for each month and got approved from the Engineer-in-Charge. The application of erosion control measures includes construction of gravel pits and tyre washing bays of approved size and specification for all vehicular site entry/ exits, protection of slopes greater than 10%. Sedimentation Collection System and run-off diversion systems shall be in place before the commencement of construction activity. Preserve and protect the existing vegetation by not-disturbing or damaging to specified site areas during construction. The trees that are identified to be retained on site are protected during the construction period using the following measures:

- a. The damage to roots is prevented during trenching, placing backfill, driving or parking heavy equipments. The dumping of trash, oil, paint and other material is detrimental to plant health.

These activities should be restricted to the areas outside of the canopy of the trees.

- ii) The trees are not used for support; their trunks should not be damaged by cutting and carving by nailing posters and advertisements or in any other way.
- iii) The lighting of fires or carrying out heat or gas emitting construction activity within the ground covered by canopy of the trees is not permitted.
- iv) The young trees of saplings identified for preservation within the construction site must be protected using tree guards of approved specification.
- v) The grades of soil should be maintained around existing vegetation.

Lowering or raising the levels around the vegetation should not be allowed unless specifically directed by the

Architect/Engineer -in - Charge.

- vi) Maintenance activities should be performed, as and when needed, to ensure that vegetation remain healthy.
- 4.12 Staging is dividing a construction area into two or more sections to minimize the area of soil that will be exposed at any given time. Staging should be done to separate undisturbed land from land disturbed by construction activity and material storage. A CAD plan to be submitted indentifying the areas of sites, which shall be disturbed for the construction activity and apart from these other areas on site should not be disturbed. Measures should be followed for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels and perimeter dike/swale should be constructed to carry the pollutant laden water directly to the treatment device or facility (municipal sewer line). The plan should indicate how the above was accomplished on site well in advance of the commencement of the construction activity.
- i) The Contractor should follow the construction plan as proposed by the architect/landscape consultant to minimize the site disturbance such as soil pollution due to spilling. Use staging and spill prevention and control plan to restrict the spilling of the contaminating material on site. Protect top soil from erosion by collection storage and reapplication of top soil, constructing sediment basin, contour trenching, mulching etc.
  - ii) Spill prevention and control plans should clearly state measures to stop the source of the spill. Measures to contain the spill and measures to dispose the contaminated material and hazardous wastes. It should also state the designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners and petroleum products.
- 4.13 A soil Erosion and Sedimentation Control Plan (ESCP) should be prepared prior to construction and should be applied effectively. Measures for prevention of top soil are given below:
- i) Top Soil should be stripped to a depth of 20 cm from the areas proposed for buildings, roads, paved areas and external services. It should be stockpiled to a maximum height of 40 cm in designated areas and reapplied during plantation of the proposed vegetation. The top soil should be separated from

- the sub soil debris and stones larger than 50 mm in diameter. The stored top soil may be used as finished grade for planting areas post construction or cordoned off undisturbed areas on site. Stockpiled top soil should not be compacted to help process of aeration. It should be stabilized on the top by temporary seeding or plastic sheets to avoid wind and water erosion.
- ii) Sedimentation basin, a temporary dam or basin at the lowest convenient point of the site should be constructed for collecting, trapping and storing sediment produced by the construction activities. A flow detention facility must also be constructed for reducing peak run-off rates. This would also allow most of the sediments to settle before the run-off is directed towards the outfall.
- iii) Contour trenching is to be provided which an earth embankment or ridge- and-channel arrangement constructed parallel to the contours, along the face of the slope, at regular intervals on the lengths and slopes greater than 10% (1:10). They are used for reducing runoff velocity, increasing the distance of overland run-off flow. They are also used to hold moisture and minimize sediment loading of surface run-off.
- 4.14 Prepare the list of trees to be felled with reference to the tree survey, Compensate the loss of vegetation (trees) due to the construction activity by compensatory plantation. Replant same native and/or non-invasive species, which existed on the site before elimination, in the proportion of 1:3 (as per the suggestion of the landscape consultant).
- 4.15 The contractor shall prepare and submit 'Spill prevention and control plans' before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.
- 4.16 The contractor shall ensure that no construction leach (Ex: cement slurry) is allowed to percolate into the ground. Adequate precautions are to be taken to safeguard against this including reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).
- 4.17 All lighting installed by the contractor around the site and at the labour quarters during construction shall be CFL bulbs of the appropriate illumination levels. This condition is a must, unless specifically prescribed.
- 4.18 All paints, adhesives and sealants should comply with the VOC limits prescribed by GRIHA, as follows:

**Table 1- VOC limits for paints, adhesives and sealants**

| <b>Paints</b>   | <b>VOC limit (g/l)</b> |
|-----------------|------------------------|
| Non-flat paints | 150                    |

|                                 |                        |
|---------------------------------|------------------------|
| Flat (Mat) paints               | 50                     |
| Anti-corrosive/anti-rust paints | 250                    |
| Varnish                         | 350                    |
| <b>Adhesives</b>                | <b>VOC limit (g/l)</b> |
| Wood flooring Adhesive          | 100                    |
| Tile adhesives                  | 65                     |
| Indoor carpet adhesives         | 50                     |
| Wood                            | 30                     |

- 4.19 All the building materials and systems used on site must be as per the specifications and approved makes by the consultants.
- 4.20 All required certificates explaining the properties of the building material/system needs to be obtained from the manufacturer/vendor as required by the green building rating authority.
- i) The final certificates would be produced after the approval of green building consultant with necessary due diligence.
- ii) The purchase orders of all the materials made with the manufacturers/authorized vendors should be maintained and shall be provided for the process with due diligence upon request.
- 4.21 Water saving measures as suggested by the consultants need to be followed on site.
- 4.22 Any other site management measures suggested by the green building consultant shall be followed on site.
- 4.23 The contractor shall submit to the Engineer-in-Charge after construction of the buildings, a detailed as built quantification of the following:
- i) Total materials used,
- ii) Total top soil stacked and total reused,
- iii) Total earth excavated,
- iv) Total waste generated,
- v) Total waste reused,
- vi) Total water used,
- vii) Total electricity consumed, and
- viii) Total diesel consumed.
- 4.24 The contractor shall submit to the Engineer-in-Charge, before the start of construction, a site plan along with a narrative to demarcate areas on site from which top soil has to be gathered, designate area where it will be stored, measures adopted for top soil preservation and indicate areas where it will be reapplied after construction is complete.
- 4.25 Evidence for the implementation of the all the above required measures shall be provided to the green building consultant in the form of photographs and templates (as provided) which is required for the submission to the green building rating authority (GRIHA).

# END OF VOLUME - III

**HSCC (India) Limited  
as Executing Agency on behalf of  
MINISTRY OF HEALTH & FAMILY WELFARE,  
NEW DELHI**

**TENDER**

**FOR  
Construction of Hospital and Academic  
Campus  
at  
All India Institute of Medical Sciences  
Mangalagiri Distt. Guntur (AP)**

**under**

**Pradhan Mantri Swasthya Suraksha Yojana  
(PMSSY)**

**VOLUME – IV**

**Technical Specification**

**JANUARY 2018**

**Executing Agency**



**HSCC (INDIA) LTD.**

**E-6(A), sector-1, NOIDA(U.P) 201301 (India)**

**Phone : 0120-2542436-40**

**Fax : 0120-2542447**

**Tender No. HSCC/PMSSY/AIIMS/Guntur/H&A/2018**



## TECHNICAL SPECIFICATIONS

### CIVIL WORKS

#### 1.0 GENERAL:-

- 1.01 The specifications and mode of measurements for Civil and Plumbing works shall be in accordance with C.P.W.D. Specifications 2009 Volumes I and II with up to date correction slips unless otherwise specified in the nomenclature of individual item or in the specifications. The entire work shall be carried out as per the C.P.W.D. specifications in force with up to date correction slips upto the date of opening of tender.
- 1.02 For the item not covered under CPWD Specifications mentioned above, the work shall be executed as per latest relevant standards/codes published by B.I.S. (formerly ISI) inclusive of all amendments issued thereto or revision thereof, if any, upto the date of opening of tenders.
- 1.03 In case of B.I.S. (formerly I.S.I) codes/specifications are not available, the decision of the Engineer based on acceptable sound engineering practice and local usage shall be final and binding on the contractor.
- 1.04 However, in the event of any discrepancy in the description of any item as given in the schedule of quantities or specifications appended with the tender and the specifications relating to the relevant item as per CPWD specifications mentioned above, or in drawings the former shall prevail.
- 1.05 In general the building floor to floor height is 4.00 mtr unless specified otherwise in the drawing. However, the rates for different items of work shall be for up to 4.5 m floor to floor height at all levels, lifts, leads and depths of the building except where otherwise specified explicitly in the item of work or in special conditions appended with the tender. All works above the top most terraces (main) shall be paid under the level existing below (i.e. machine room, mumty etc)
- 1.06 The work shall be carried out in accordance with the architectural, structural, plumbing and electrical drawings etc. The drawings shall have to be properly correlated before executing the work. In case of any difference noticed between the drawings, final decision, in writing of the Engineer shall be obtained by the contractor. For items, where so required, samples shall be prepared before starting the particular items of work for prior approval of the Engineer and nothing extra shall be payable on this account.

- 1.07 All materials to be used on works shall bear I.S. certification mark unless specifically permitted otherwise in writing. In case I.S. marked materials are not available (not produced), the materials used shall conform to I.S. Code or CPWD specifications, as applicable in this contract.

In such cases the Engineer shall satisfy himself about the quality of such materials and give his approval in writing. Only articles classified as "First Quality" by the manufacturers shall be used unless otherwise specified. All materials shall be tested as per provisions of the Mandatory Tests in CPWD specifications and the relevant IS specifications. The Engineer may relax the condition regarding testing if the quantity of materials required for the work is small. Proper proof of procurement of materials from authentic manufacturers shall be provided by the contractor to the satisfaction of Engineer. Grade of cement used shall be OPC 43 Grade unless otherwise specified explicitly. The contractor shall get the Design Mix for RCC done by the labs approved by OWNER only. Reinforcement Steel used shall be of TMT Fe-500 unless otherwise specified.

- 1.08 In respect of the work of the sub-agencies deployed for doing work of electrification, air-conditioning, external services, other building work, horticulture work, etc. for this project and any other agencies simultaneously executing other works, the contractor shall afford necessary coordination and facilities for the same. The contractor shall leave such necessary holes, openings, etc. for laying / burrying in the work pipes, cables, conduits, clamps, boxes and hooks for fan clamps, etc. as may be required for the electric, sanitary air-conditioning, fire fighting, PA system, telephone system, C.C.T.V. system, etc. and nothing extra over the agreement rates shall be paid for the same.
- 1.09 Unless otherwise specified in the bill of quantities, the rates for all items of work shall be considered as inclusive of pumping out or bailing out water if required for which no extra payment will be made. This will include water encountered from any source such as rains, floods, or due to any other cause whatsoever.
- 1.10 Any cement slurry added over base surface (or) for continuation of concreting for bond is added its cost is deemed to have in built in the item unless otherwise/explicitly stated and nothing extra shall be payable or extra cement considered with consumption on this account.
- 1.11 The rate for all items in which the use of cement is involved is inclusive of charges for curing.
- 1.12 The contractor shall clear the site thoroughly of all scaffolding materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer before the work is considered as complete.
- 1.13 Rates for plastering work (excluding washed grit finish on external wall surfaces) shall include for making grooves, bands etc. wherever required and nothing extra shall be paid for the same.
- 1.14 The rates quoted for all brick/concrete work shall be deemed to include making openings and making good these with the same specifications as shown in drawings

and/or as directed. No extra payment shall be made to the contractor on this account.

- 1.15 Rates for all concrete/plaster work shall include for making drip course moulding, grooves etc. wherever required and nothing extra shall be paid for the same.
- 1.16 Rates for flooring work shall include for laying the flooring in strips/as per sample or as shown in drawings wherever required and nothing extra shall be paid for the same.
- 1.17 The drawing(s) attached with the tender documents are for the purpose of tender only, giving the tenderer a general idea of the nature and the extent of works to be executed. The rates quoted by the tenderer shall be deemed to be for the execution of works taking into account the "Design Aspect" of the items and in accordance with the "Construction Drawings" to be supplied to the Contractor during execution of the works.
- 1.18 The quoted rate shall be for finished items and shall be complete in all respects including the cost of all materials, labour, tools & plants, machinery etc., all taxes, duties, levies, octroi, royalty charges, statutory levies etc. applicable from time to time and any other item required but not mentioned here involved in the operations described above. The client/OWNER/Employer shall not be supplying any material, labour, plant etc. unless explicitly mentioned so.
- 1.19 On account of security consideration, there could be some restrictions on the working hours, movement of vehicles for transportation of materials and location of labour camp. The contractor shall be bound to follow all such restrictions and adjust the programme for execution of work accordingly.
- 1.20 The contractor has to ensure co-ordination with Institute authorities to maintain the smooth functioning / operation of existing Institute without disruption during the execution of work. This may require working rescheduling the normal working hours, working in restricted period etc. Nothing extra shall be payable on this account.

He shall also ensure that all work sites within the Institute complex are properly cordoned off by means of barricades and screens upto a height of 3.0 m above ground level. The contractor shall use painted CGI sheets which are in good condition mounted on steel props.

- 1.21 Stacking of materials and excavated earth including its disposal shall be done as per the directions of the Engineer-in-Charge. Double handling of materials or excavated earth if required shall have to be done by the contractor at his own cost.
- 1.22 The agency will have to take prior approval of the Engineer/ Architect for the make of materials before procurement of the same. It may also be noted that if any of the makes given in the List of Makes does not comply with Standards, it will not be allowed to use. No claim what so ever shall be entertained on this account.

## **2.0 POST TENSION SLAB**

### **2.1 Prestressing Works.**

4.6.1 This section covers the technical requirements for general use of Prestressing in cast-in-situ and pre-cast works and shall include incidental items of work not shown or specified except where otherwise modified or amended within the Contract.

### **2.2 CODES AND STANDARDS**

2.2.1 Where the Prestressing is to be used in any building works, the Prestressing shall comply with the requirements of the latest version of Indian Standards (IS), except where more stringent requirements are specified herein. A Complete set of all these documents shall generally be available at site with the Contractor.

2.2.2 For any particular aspect not covered in appropriate IS code, any international code or practice as may be specified by the Engineer shall be, followed.

2.2.3 List of certain important Indian Standards and Codes applicable to this work is given below. These Standards shall apply. However, the applicable standards and codes shall be as per, but not limited to the list given below:

Uncoated stress relieved low relaxation seven-ply strand for prestressed concrete-specification.

All Codes and Standards referred to shall be latest versions.

IS: 1343-1980 Code of Practice for Prestressed Concrete (First Rev).

IS: 14268-1995 Uncoated Stress relieved low relaxation Seven- Ply Strand for prestressed Concrete- Specification.

IS: 513-1994 (Rev.) Cold-rolled low carbon steel sheets and strip (Fourth

BS: 4447 – 1973 Specification for the performance of prestressing anchorages for post-tensioned construction.

2.2.4 The Contractor must understand thoroughly any such requirements stated by the foregoing Codes and Regulation- before tendering. He shall also construct the work in strict accordance with the Specification, working drawings and written instructions issued by the Engineer.

2.2.5 The Engineer reserves the right to check the work constructed by the Contractor. and his setting out at such times as he may deem fit. There is however no duty on his part to make such checks and any omission by him to observe errors shall not relieve the Contractor of his responsibilities in these respects

### **2.3 General**

2.3.1 Unless otherwise specified all work and materials shall conform to latest applicable issue of IS specification

### **2.3.2 Preliminary Information from Contractor**

The Contractor shall submit the following information on his proposals for the approval of the Engineer before work is commenced.

- a) Source of supply of prestressing steel
- b) Source of supply of sheeting ducts
- c) Source of supply of anchorages
- d) Results of tests on prestressing steel
- e) Results of tests on anchorages
- f) Types of Prestressing jacks
- g) Types of Dynamometers and pressure gauges.
- h) Types of grout pumps
- i) Types of admixtures for duct grouting and end pocket grouting

### **2.3.3 Prestressing Steel Cutting Schedules**

Prestressing steel cutting schedules shall prepared by the Contractor and submitted to the Engineer as and when directed.

### **2.3.4 Approvals**

2.3.4.1 The Contractor shall supply to the Engineer for his approval, a minimum of 14 working days before construction commences, detail of his prestressing equipment, materials etc.

2.3.4.2 The Contractor should note that further approvals are required by the Specification before construction starts. The Contractor is wholly responsible for obtaining these approvals and no claim for delays or additional payments will be entertained due to the Contractor's failure to obtain such approvals in adequate time.

2.3.4.3 Any approval, instructions, permission, checking, review etc. whatsoever by the Engineer, shall not relieve the Contractor of his responsibility and obligation adequacy, correctness, completeness, safety, strength, quality, workmanship etc.

### **2.3.5 Contractors Responsibility and Defects**

2.3.5.1 The Contractor shall furnish all skilled and unskilled labour, plant, equipment, scaffolding, all materials etc. required for complete execution of the work in accordance with the drawings and as described herein and /or as directed by the Engineer.

2.3.5.2 The fact that the Contractor has used materials, etc. with the approval of the Engineer shall in no way relieve the Contractor of his responsibilities of producing required minimum strength, durability, elongations etc. for the purpose to which it is put.

2.3.5.3 Any defects due to materials and workmanship not being in accordance with this specification shall be made good to the satisfaction of the Engineer by the Contractor at his own expense.

2.3.5.4 The Contractor shall be responsible for making good to the satisfaction of the Engineer any damage to the permanent structure, which may be caused by his plant.

### **2.3.6 Source of Supply**

The Contractor shall not alter the source of supply any material from that initially approved by the Engineer without the prior written permission of the Engineer.

### **2.3.7 Safety and site Condition**

The Contractor shall strictly follow, at all stages of work, the stipulations contained in the Indian Standard Safety Code and the provision of the safety rules as specified in the General Conditions of the Contract for ensuring safety of men and materials and in the event of an accident shall hold the Employer blameless.

### **2.3.8 Quality Control**

2.3.8.1 The Contractor shall submit to the Engineer, within 14 days of award, a Quality manual in accordance with ISO 9001. The Quality Manual shall outline the Quality Control measures that the Contractor shall put in place to carry out the Works and shall include the Quality Control of the Subcontractors. The Quality Manual shall include a Project Quality Plan. The Quality Manual shall be reviewed by the Engineer and, upon acceptance, shall be implemented by the Contractor.

The Contractor shall submit to the Engineer, within 14 days of award, a list of the Quality Control Personnel proposed for the Works and shall outline roles and responsibilities. Staff listed shall include the Project Manager, Quality Control Superintendent and Project Foreman. If, for some reason, a person so listed is unable to fulfill their role in this Works, then the Contractor shall find an equivalent qualified person to fill that vacancy.

The Contractor shall establish, document and maintain an inspection and testing system capable of producing objective evidence that the Works conform to the Specification, whether carried out by the Contractor or his sub-contractors, or procured from vendors. A summary of this system shall be included in the Quality Manual.

## **2.4 Materials.**

### **2.4.1 Prestressing Steel:**

Prestressing steel shall conform to Class-2 strands of IS: 14268 - 1995 low relaxation type. The Strand shall have minimum yield strength of 1860 N/Sqm and Young's modulus of 195000 N/Sqm.

### **2.4.2 Sheathing Ducts:**

The sheathing ducts shall be of the standard flat duct (smooth type). Unless otherwise specified, the material shall be Cold Rolled Cold Annealed (CRCA) Mild Steel conforming

to IS: 513-1994 intended Jar mechanical treatment and surface refining but not for quench hardening or tempering.

The material shall normal be bright finished. However, where specified, as in case of use in aggressive environment, galvanized or lead-coated mild steel strips shall be used.

The thickness of sheathing shall be as shown on the drawing, but shall not be less than 0.3 mm for sheathing duct having external clear dimension of 75mmx 20mm for 5-4 or 5-5 (13mm or a.5inch dia - 4 or 5 Nos.) prestressing tendons. Otherwise thickness of sheathing shall be based on recommendations of prestressing system supplier or as directed by the Engineer.

Long lengths of sheathing ducts may be used with consequent reduction *in* the number of joints and couplers. Where sheathing duct joints are unavoidable. such joints shall be made slurry tight to the satisfaction of the Engineer .

The length of the coupler shall be followed strictly as shown on the drawing" The joints between couplers shall be sealed with tape to prevent penetration of cement slurry during concreting. The couplers .of adjacent ducts should be staggered wherever practicable. As far as possible. Couplers should not be located in curved zones.

The internal area of the sheathing duct shall be in accordance with the recommendations of the system manufacturer and as approved by the Engineer.

#### **2.4.3. Anchorages.**

The type of Anchorages shall be as shown on the drawing or as directed by the Engineer. Anchorages shall be procured from authorized manufacturers only and shall conform to BS: 4447-1973. Test certificates from a laboratory fully equipped to carry out the tests shall be furnished to the Engineer. Such test certificates shall not be more than 12 months old at the ;:me of making the proposal for adoption of a particular system for the project.

No damaged anchorages shall be used. Steel parts shall be protected from corrosion at all times. Threaded parts shall be protected by greased wrappings and tapped holes shall be protected by suitable plugs until used. The anchorage components shall be kept free from mortar and loose rust and any other deleterious coating.

Untensioned steel reinforcements. around anchorages shall conform to the *details* of prestressing system and as Shown on the drawing.

#### **2.4.4 Testing of Prestressing Steel and Anchorages.**

All materials specified for testing shall be furnished free of cost and shall be delivered in time for tests to be made well in advance of anticipated time of use.

All Wire. Strand or bars to be shipped to the site shall be assigned a lot number and tagged for identification purposes. Anchorage assemblies to be shipped shall be like-wise identified.

All samples submitted shall be representative of the lot to be furnished and in

the case of wire or strand, shall be taken from the same master roll. The Contractor shall furnish samples of at least 5.0 m length selected from each lot for testing. Also, two anchorages assemblies, complete with distribution plates of each size or types to be used, shall be furnished along with short lengths of strands as required.

## **2.5 Workmanship**

### **2.5.1 Cleaning**

Tendons shall be free from loose rust, oil, grease, tar, paint, mud or any other deleterious substance.

Cleaning of the steel may be carried out by immersion in suitable solvent solutions, wire brushing or passing through a pressure box containing carborundum powder. However, the tendons shall not be brought to a polished condition.

### **2.5.2 Straightening**

High tensile steel wire and strand shall be supplied in coils of sufficiently large diameter such that tendons shall retain their physical properties and shall be straight as it unwinds from the coil. Tendons of any type that are damaged, kinked or bent shall not be used.

The packing of prestressing wire/strand shall be removed only just prior to making of cable for placement. Suitable stands shall be provided to facilitate uncoiling of wires/strands without damage to steel. Care shall be taken to avoid the possibility of steel coming into contact with the ground

### **2.5.3 Positioning for Post Tensioning**

Prestressing tendons shall be accurately located and maintained in position both vertically and horizontally as per drawings

Tendons shall be so arranged that they have a smooth profile without sudden bends or kinks.

Sheathing shall be placed in correct position and profile by providing suitable ladders and spacers. Such ladders may be provided at intervals of approximately 1.0 m. Sheathing shall be tied rigidly with such ladders/spacer bars so that they do not get disturbed during concreting.

The method of supporting and fixing shall be such that profile of cables is not disturbed during vibrations, by pressure of wet concrete, by workmen or by construction traffic.

Sheathing in which the permanent tendon will not be in place during concreting shall have a temporary tendon inserted or shall be stiffened by some other method to the approval of the Engineer. The temporary tendon shall be pulled out before threading the permanent tendon into place by a special threading machine or other contrivance. Stressing. Tendons shall be handled with care to avoid damage or contamination, to either the tendon or the sheathing.

Any tendons damaged or contaminated shall be cleaned or replaced.



#### 2.5.4 Cutting

Extra length of strands at the ends shall be cut after 12 hours from stressing of the last strand in the particular floor. Cutting and trimming of wires or strands shall be done by using hacksaw blades/abrasive cutter/cutting wheel and not by any other means like gas cutting etc.

In post-tensioning, the ends of prestressing steel projecting beyond the anchorages, shall be cut after the grout has set

#### 2.5.5 Protection of Prestressing Steel

Prestressing steel shall be continuously protected against corrosion, until grouted. The corrosion protector shall have no deleterious effect on the steel or concrete or on the bond strength of steel to concrete. Grouting shall conform to these specifications or as directed by the Engineer

#### 2.5.6 Sheathing

The joints of all sheathings shall be watertight. Special attention shall be paid to the junction at the anchorage end, where the sheathing must tightly fit on the protruding trumpet end of anchorage and thereafter sealed preferably with heat shrink tape, to make it waterproof.

The heat-shrink tape is supplied in the form of bandage rolls, which can be used for all diameters of sheathing ducts. The bandage is coated on the underside with a heat sensitive adhesive so that after heating the bandage material shrinks on the sheathing duct and ensures formation of a leak-proof joint. The heating is effected by means of a soft gas flame.

The sheathing and all joints shall be watertight. Any temporary opening in the sheathing shall be satisfactorily plugged and all joints between sheathing and any other part of the prestressing system shall be effectively sealed to prevent entry of mortar, dust, water or other deleterious matter. Sheathing shall be neatly fitted at joints without internal projection or reduction of diameter.

Enlarged portions of the sheathing at couplings or anchorages shall be of sufficient length to provide for the extension of the tendons.

#### 2.5.7 Grout Vents

Grout vents of at least 20 mm diameter shall be provided at both ends of the sheathing and at all valleys and crests along its length. Additional vents with plugs shall also be provided along the length of sheathing such that the spacing of consecutive vents do not exceed 20 m. Each of the grout vents shall be provided with a plug or similar device of withstanding a pressure of 1.0 MPa without the loss of water, air pressure or grout.

#### 2.5.8 Anchorages

All bearing surfaces of the anchorages shall be cleaned prior to concreting and tensioning.

Anchor cones, blocks and plates shall be securely positioned and maintained during concreting such that the centre line of the duct passes axially through the anchorage assembly.

The anchorages shall be recessed from the concrete surface by a minimum cover of 100 mm.

After the prestressing operations are completed and prestressing wires /strands are cut, the surface shall be painted with two coats of epoxy of suitable formulation having a dry film thickness of 80 microns per coat and entire recess shall be filled with Epoxy grout 'Nitomortar S' of Fosroc or any other approved equivalent. The grout shall be allowed to set as per manufacturer's written instruction and only then grouting of the duct shall be carried out.

### **2.5.9 Supervision**

All prestressing and grouting operations shall be undertaken by trained personnel only. A representative of supplier of the prestressing system shall be present during all tensioning and grouting operations and shall ensure, monitor and certify their correctness

### **2.5.10 Tensioning Equipment**

All tensioning equipment shall be procured from authorized manufacturers only and be approved by the Engineer prior to use. Where hydraulic jacks are used, they shall be power-driven unless otherwise approved by the Engineer. The tensioning equipment shall satisfy the following requirements

- i) The means of attachments of the prestressing steel to the jack or any other tensioning apparatus shall be safe and secure.
- ii) The tensioning equipment shall be such that it can apply controlled total force gradually on the concrete without inducing dangerous secondary stresses in steel, anchorage or concrete.
- iii) Means shall be provided for direct measurement of the force by use of dynamometers or pressure gauges fitted in the hydraulic system itself to determine the pressure in the jacks. Facilities shall also be provided for the linear measurement of the extension of prestressing steel to the nearest mm and of any slip of the gripping devices at transfer.

All dynamometers and pressure gauges including a master gauge shall be calibrated by an approved laboratory immediately prior to use and then at intervals not exceeding 3 months and the true force determined from the calibration curve.

Pressure gauges shall be concentric scale type gauges accurate to within two per cent of their full capacity. The minimum nominal size of gauge, shall be 100 mm. The gauge shall be so selected that when the tendon is stressed to 75 per cent of its breaking load, the gauge is reading between 50 per cent and 80 per cent of its full capacity. Suitable safety devices shall be fitted to protect pressure gauges against sudden release of pressure. Provision shall be made for the attachment of the master gauge to be used as a check whenever requested for by the Engineer

### **2.5.11 Post – Tensioning**

Tensioning force shall be applied in gradual and steady steps and carried out in such a manner that the applied tensions and elongations can be measured at all items. The

sequence of stressing, applied tensions and elongations shall be in accordance with the approved drawing as directed by the Engineer.

The jack and pump should be properly calibrated before the stressing operation and relevant certificate shall be submitted to the Engineer for approval before starting any stressing operation.

It shall be ensured that in no case the load is applied to the concrete before it attains the strength specified on the drawing or as stipulated by the pre stressing supplier, whichever is more.

After pre stressing steel has been anchored, the force exerted the by the tensioning equipment shall be decreased gradually and steadily so as to avoid shock to the pre stressing steel or anchorage.

The tensioning force applied to applied to any tension shall be determined by direct reading of the pressure gauges or dynamometer and by comparison of the measured elongation with the calculated elongation. The calculated elongation shall be invariably adjusted with respect to the modulus of shall be invariably adjusted with respect to the modulus of elasticity of steel for the particular to as given by manufacture.

The difference between calculated and observed tension and elongation during prestressing operation shall be regulated as follows:

If the calculated elongation has not been reached at the specified gauge pressure continue tensioning by intervals of 5kg/sq.cm unit the calculated elongation is reached provided the gauge pressure does not exceed 1.05 times the specified gauge pressure.

If elongation at 1.05 times the specified gauge pressure is less than 0.95 times the calculated elongation, further operation such as cutting on sealing, should not be undertaken without with out the approval of the Engineer.

When stressing from one end only the slip at the remote from the jack shall be accurately measured and an appropriate allowance made in the measured extension at the jacking end

Since the strands are not initially just there may be some amount of initial slack in each strand which shall be accounted for at the final elongation. The correction factor to this effect shall be applied as per the stressing format. The format shall be filled for each and every strand.

A complete record of prestressing operation with elongation and jack pressure data shall be maintained in format given the Engineer. The number of stages of pre stressing and grouting shall be reduced to a to minimum as directed by the Engineer.

### **2.5.12 Grouting of prestressed tendons**

In general, grouting shall conform to IS: 1343-1980. A record of grouting operations shall be maintained in the format given by the Engineer.

#### **2.5.12.1 Grout Mixture and Agitator**

It is essential that the grout is maintained in a homogeneous state and of Uniform consistency so that there is no separation of cement. Use of grout mixers to obtain a colloidal grout is essential. The mixer should have an additional storage device with an agitator to keep the grout moving continuously before it is pumped in the duct. Positive reciprocating type I grout pumps should be used.

#### **2.5.12.2 Grout Pump.**

The pump should be a positive displacement type and should be capable of ejecting the grout in a continuous operation and not by way of pulses. The grout pump must be fitted with a pressure gauge to enable pressure of injection to be controlled. The minimum pressure at which grout should be pumped shall be 0.3 MPa and the grout pump must have a relief arrangement for bypass of the grout in case of buildup of pressure beyond 1MPa. The capacity of the grout pump should be such as to achieve forward speed of grout of around 5 to 10 meters per minute. The slower rates are Preferable as they reduce the possibility of occurrence of voids.

Use of hand pumps for grouting, is not recommended. Use of compressed air operated equipment for injection is prohibited. as it is likely that there will be some air trapped in grout.

#### **2.5.12.3 Water Pump**

Before commencement of grouting, a standby direct feed high-pressure water pump should be available at site for an emergency. In case of any problem in grouting the ducts, such pump shall immediately be connected to the duct and all grout flushed by use of high pressure water flushing. It is, therefore, necessary to have adequate storage of clean potable water for operation of the water pump for such emergencies.

#### **2.5.12.4 Grout Screen**

The grouting equipment should contain a screen having a mesh size of 106 micron size. Prior to introduction into the grout pump, the grout should be passed through such screen. This screen should be easily accessible for inspection and cleaning.

#### **2.5.12.5 Connections and Air Vents**

Standard details of fixing inlets, outlets and air vents to the sheathing and/or anchorage should be followed as recommended by specialist supplier of the system of prestressing

#### **2.5.12.6 Properties of Grout**

Water/cement ratio should be as low as possible, consistent with workability. This ratio should not normally exceed 0.4.

A suitable non-aluminium base d expanding agent may be added to the grout 0.4% by weight of cement -INTRA PLAST N200' by SIKA or approved equivalent.

Before grouting, the properties of the grout mix should be tested in a laboratory depending on the facilities available. Tests should be conducted for each job periodically.

Compressive strength: The compressive strength of 100 mm cubes of the grout shall, not be less than 17 MPa at 7 days. Cubes shall be cured in a Moist atmosphere for the first 24 hours and subsequently in water. These tests shall be conducted in advance to ascertain the suitability of the grout mix.

#### **2.5.12.7 Mixing Of Grout**

Proportions of materials should be based on field trials made on the grout before commencement of grouting, but subject to the limits specified above. The materials should be measured by weight.

Water should be added to the mixer, first, followed by Portland cement and sand, if used. Admixture if any, may be added as recommended by the manufacturer.

Mixing time depends upon the type of the mixer, but will normally be between 2 and 3 minutes. However, mixing should be for such a duration as to obtain uniform and thoroughly blended grout, without excessive temperature increase or loss of expansive properties of the admixtures. The grout should be continuously agitated until it is injected.

#### **2.5.12.8 Grouting operations**

##### **2.5.12.8.1 General**

Grouting shall be carried out 24 hours after, stressing the strands but not later than 2 weeks of stressing a tendon and after thoroughly flushing the sheathing with water. Whenever this stipulation cannot be complied with for unavoidable reasons, adequate temporary protection of the steel against corrosion by methods or products which will not impair the ultimate adherence of the injected grout should be ensured till grouting. The sealing of the anchorage ends after concreting is considered to be a good practice to prevent ingress of water.

##### **2.5.12.8.2 Injection of Grout.**

- i) After mixing the grout should be kept in continuous movement.
- ii) Injection of grout must be continuous and should not be interrupted.
- iii) The method of injection should ensure complete filling of the ducts. To verify this, it is advisable to compare the volume of the space to be filled by the injected grout with the quantity of grout actually injected.
- iv) Grouting should be commenced initially with a low pressure of injection of upto 0.3 MPa increasing it until the grout comes out at the other end. The grout should be allowed to flow freely from the other end until the consistency of the grout at this end is the same as that of the grout at the injection end. When the grout flows at the other end, it should be closed off and building up of pressure commenced. Full injection pressure at about 0.5 MPa shall be maintained for at least one minute before closing the injection pipe. It is recommended practice to provide a standby pipe at the highest point of the tendon profile to hold all water displaced by sedimentation or bleeding. If there is a built up of pressure much in excess of 1 MPa without flow of grout coming at the other end, the grouting

operation should be discontinued and the entire duct flushed with high pressure water. Also, the bypass system indicated above is essential for further safety.

v) Grout not used within 30 minutes of mixing should be rejected.

#### 2.5.12.9 **Safety Precautions during Tensioning.**

Care shall be taken during tensioning to ensure the safety of all persons in the vicinity. Jacks shall be secured in such a manner that they will be held in position, should they lose their grip on the tendons.

No person shall be allowed to stand behind the jacks or close to the line of the tendons while tensioning is in progress.

The operations of the jacks and the measurement of the elongation and associated operations shall be carried out in such a manner and from such a position that the safety of all concerned is ensured.

A safety barrier shall be provided at both ends to prevent any tendon, which might become loose from recoiling unchecked.

During actual tensioning operation, warning sign shall be displayed at both ends of the tendon.

After prestressing, concrete shall neither be drilled nor any portion cut nor chipped away nor disturbed. without express approval of the Engineer.

No welding shall be permitted on or near tendons nor shall any heat be applied to tendons. Any tendon which has been affected by welding, weld spatter or heat shall be rejected.

#### 2.5.12.10

Adequate precautions shall be taken to maintain the sheathing in correct profile and level during concreting operations. The sheathing shall be supported at close intervals not more than 1m. Any reinforcement fouling with the sheathing shall be deviated locally. Permissible tolerances for positional deviation of prestressing tendons shall be limited to the following:

- i) Variation from the specified horizontal profile: 25 mm.
- ii) Variation from the specified vertical profile: 3 mm

#### 2.6 **Rate.**

The contract unit rate for high tensile steel shall as contained in BOQ item -- nos cover the cost of designing of PT slab, labour, tools and plant required for manufacturing, placing, tensioning, anchoring and grouting the high tensile steel in the prestressed concrete as shown on the drawings sleeves etc required to pass services per specifications herein above or as directed by the Engineer

The cost of anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grout, non-prestressed steel reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing

samples for testing shall all be included in the unit rate of the above said items. Rates shall also include payments if any to be made to the supplier of the prestressing system who has to monitor, ensure and certify the correctness of all operations.

### **3.00 Signages and associated works**

#### **General**

1. The sign board shall be in both English and Hindi language
2. Suitable pictogram to be provided as per approved samples
3. The colour of signages to be as per discretion of Engineer.
4. All signages details including sizes of sheet, letters, pictogram and border allround to be submitted and got approved priorly from HSCC.
5. The quoted rate shall be for all heights and floor levels.
6. The scope of work include providing and fixing base frame with removable/ interchangeable signages. Which will be paid in respective items

#### **PVC sheet / sun board**

1. Sheet to be best available brand of minimum thickness 3mm.
2. Top vinyl film to be best available brands of LG, Samsung or equivalent.
3. The thickness of film without adhesive to be around 75 microns and with adhesive to be 100 microns.
4. The fixing to be done with screws / hanging chains/pipes/rods of approved make & material as per discretion of Engineer.
5. The rates to be quoted per square inch inclusive of pictogram & fixing up to any floor and height, wall fixing or hanging on ceiling.

#### **MS**

1. The make of material to be as approved by engineer.
2. The thickness of GI sheet to be at least 18 G.
3. The shop drawings of supporting structural frame and its foundation for signages to be submitted for approval by HSCC.
4. The welding joints to be rubbed and grinded to give a smooth finish. No undulations shall be visible.
5. The MS frame and sheets to be primered and painted with approved make material.
6. The rates shall be inclusive of above and fixing with cement concrete 1: 1.5 : 3 as per approved design.
7. The rate for structural frame to be quoted separately per kilograms and signage sheet in square meters.

#### **Stainless steel**

1. The thickness of sheet to be minimum 16 G for plate sign board and 18/20 G for SS letters.
2. The same to be fixed with SS screws.
3. The engraving of letters to be as per standard norms and colours.
4. The individual alphabets/ letters, wherever required to have an inbuilt arrangement for fixing to support base with stainless steel screws complete for all heights and levels. All corners to be smoothly finished & SS welding.
5. The sheet/letters may be shining or mat finish as approved by engineer.

## Aluminum

The thickness of sheet to be minimum 3mm.

1. Fixing to be done with SS or appropriate screws to avoid bimetallic action with aluminum.
2. The rates to be quoted per square meter.
3. The hanging aluminum hollow section to be of 100mm and 150mm width & make to be got approved. The powder coating of approved colour to be done and letters of approved specs and design to be pasted on such hanging aluminium hollow sections.
4. The hanging will be done by adjustable MS/GI rods of approved diameter and painting thereafter

## Neon Glow signages

1. The diameter of tube to be got approved.
2. Make to be got approved.
3. Matter to be got approved.
4. To be made from 100% handcraft glass.
5. Rate to include electric wiring to illuminate complete in all respect as directed.

**SAMPLES OF ALL MATERIALS, LETTERS MATTERS AND DESIGNS TO BE GOT APPROVED by ARCHITECT/ CLIENT BEFORE EXECUTION OF WORK.**

## **5.00 LIST OF APPROVED MAKES : CIVIL WORKS**

| S.No | Material  | Recommended Makes  |
|------|---|--|
| 1    | Doors & Windows fixtures/ Fittings              | Dorma, Godrej, Arkay, Hafele, Ozone, Hettich   |
| 2    | Door Closer / Floor spring                      | Dorma, Godrej, Dorset, D-Line, Hardwyn   |
| 3    | Aluminium Sections.                             | Hindalco, Jindal, Indal  |
| 4    | Clear Glass/ Clear Float Glass/ Toughened Glass | Saint Gobain, Asahi, Pilkington, Glaverbel, Modi Guard                                   |
| 5    | Laminates                                       | Greenlam, Merino, Formica, Kitply, Century   |
| 6    | Synthetic Enamel Paints                         | Asian, Berger, ICI, Nerolac  |
| 7    | Oil Bound Distemper                             | Asian, Berger, ICI, Nerolac  |
| 8    | Cement Paint                                    | Snowcem plus, Asian, Berger  |
| 9    | Plastic Emulsion Paint                          | Asian, Berger, ICI, Nerolac  |
| 10   | Other Paints/Primers                            | Asian, Berger, ICI, Nerolac, Shalimar  |
| 11   | OPC 43 Grade Cement (Conforming to IS 8112)     | ACC, Ultratech, Vikram, Shree Cement, Ambuja, Jaypee Cement, Century Cement & J.K.Cement |
| 12   | Reinforcement Steel (TMT Bars)                  | SAIL, RINL, TISCO  |
| 13   | Glass Mosaic Tiles                              | Bissazza, Mridul, OpioMosaica, Paladio, Italia   |
| 14   | MS Pipe/ Sections                               | Jindal, Tata, SAIL   |
| 15   | Polycarbonate Sheets                            | GE Plastic, Gallina (USA), Macrolux (UK)   |
| 16   | Wooden Fire Check Doors                         | Navair, Pacific, Sukriti   |
| 17   | Metal Fire Check Doors                          | Navair. Shaktimet, Godrej, Pacific, Sukriti  |



|    |   |   |
|----|---|---|
| 18 | Admixtures for concrete.                                      | CICO, Fosroc, Sika, MC-Bouchemie, Pidilite, BASF, STP |
| 19 | Ceramic Tiles   | Kajaria, Somany, Naveen                               |
| 20 | Pre-Laminated Particle Board                                  | Greenlam, Duro, Merino, Kitlam, Century, Action Tesa  |
| 21 | Flush Door Shutters   | Greenply, Duro, Kitply, Century                       |
| 22 | White Cement  | JK White, Birla White                                 |
| 23 | Powder Coating Material Pure Polyester                        | Nerolac, Berger, J&N                                  |
| 24 | Stainless Steel Screws For Fabrication and fixing of Windows. | Kundan, Pooja, Atul                                   |
| 25 | Dash Fasteners./Anchor bolts, Cramps                          | Hilti, Fischer, Bosch, Canon                          |
| 26 | Stainless Steel Friction Stay                                 | Earl-Bihari, Securistyle, Hafele, Hettich             |
| 27 | Weather Silicon   | Dow Corning, Wacker, G.E.                             |
| 28 | Structural Silicon at butt joints                             | Dow Corning, Wacker, G.E.                             |
| 29 | Water proofing Compound                                       | CICO, Fosroc, MC-Bouchemie, BASF, Pidilite, Sika      |
| 30 | Reflective Glass  | Saint Gobain, Asahi, Glaverbel, Modiguard             |
| 31 | Door Locks/Latches  | Dorma, D-Line, Harrison, Yale, Hettich, Godrej        |
| 32 | Aluminium Grill   | Hindalco, Jindal, Bhoruka                             |
| 33 | Vitrified Tiles   | Kajaria, Somany, Naveen                               |
| 34 | Aluminium Cladding sheets                                     | Alucobond or equivalent                               |
| 35 | Stainless steel D-handles                                     | D-Line, Dorma, Dorset, Giesse, Ozone, Hettich, Hafele |
| 36 | Stainless Steel Railing/ pipe/ sheet                          | Jindal, SAIL  |
| 37 | Structural Steel  | TATA, SAIL, RINL                                      |
| 38 | Ready Mix Concrete  | ACC, Ultratech, L&T, Lafarge                          |
| 39 | Epoxy Flooring/ wall coating                                  | Fosroc, BASF, STP, Sika, Dr Beck                      |
| 40 | Acoustic Mineral Fibre  | Armstrong, USG, Hunter Douglas, Dexune                |
| 41 | Fire Panic bar/ hinges  | Dorma, D-Line, Briton, Becker FS                      |
| 42 | Plywood/ Block Board  | Greenply, Kitply, Merino, Duro, Century               |
| 43 | PVC Flooring  | Gerflor, Tarkett, Armstrong                           |
| 44 | Fire Seal   | Pemco, Lorient, Astroflame                            |
| 45 | Fire rated door closer/Mortice Lock/ Door Co-ordinator        | Dorma, D-Line, Briton, Becker FS                      |
| 46 | Gypsum Board System   | Gyproc (Saint Gobain), USG, Boral                     |
| 47 | Adhesive for Wood Work  | Fevicol, Vemicol, Dunlop, Pidilite                    |
| 48 | Epoxy/PU Paint  | Fosroc, Pidilite, Cico, BASF, Sika, Berger, Nerolac   |
| 49 | Glass Doors (Motorised)                                       | Dorma, Hafele, Ozone, Besam, Hettich                  |
| 50 | Automaticaaly Hermetically Sealed Sliding (OT) Door           | Metaflex, SHD Italia, Stryker                         |
| 51 | Calcium silicate boards/ Tiles                                | Hilux, Aerolite, Armstrong                            |

|             |  |   |
|-------------|--|---|
| 52          | Texture Paints   | Asian, Berger, Nerolac, ICI Dulux, Snowcem  |
| 53          | Wall care putty  | JK, Birla   |
| 54          | Frameless glass partition fixtures/ Spider fittings/ patch fittings  | Dorma, Sevax, Geze, Ozone, Hafele, Hettich  |
| 55          | U-PVC Windows  | Fenesta or approved equivalent  |
| 56          | Toilet Cubicles  | GreenlamSturdo, Merino, Trespa  |
| 57          | Agencies for PT Slab work  | Ultracon Structural Systems Pvt. Ltd., GP Spiro Duct & Tube Gurgaon, BBR (India)Pvt. Ltd Bangalore, VSL India Pvt Ltd Chennai |
| 58          | Fire rated Glass   | Saint Gobain, Pilkington, Schott, Pyroguard   |
| 59          | Fibre Glass Rigid Board  | FGP Ltd., UP Twiga, Kimmco  |
| 60          | Mineral Wool/ Rockwool   | Rockwool India Pvt. Ltd., Lloyd   |
| 61          | Heat Resistance Tile   | Thermatek, National   |
| 62          | Bitumen  | Indian Oil, Hindustan Petroleum   |
| 63          | AAC Block, Fly ash brick, pavers, kerb stone, 3D wall  | As approved by Engineer In charge   |
| 64          | Stainless Steel Door Handles, Locks and Fittings   | Dorma, Hafele, Geze, Hettich, Ozone, Godrej   |
| 65          | Acid/ Alkali Resistant Tile  | Somany, Kajaria   |
| 66          | Acrylic Exterior Paint   | Asian, Berger, ICI Dulux, Nerolac, J&N  |
| 67          | PVC Door frame and Shutters  | Rajshri, Sintex   |
| 68          | Metal False Ceiling  | Armstrong, Durlum, Saint Gobain   |
| 69          | Tendons for PT slab  | TATA, Usha Martin   |
| <b>Note</b> | <b>Final choice of make mentioned above shall remain with the Engineer in charge</b>                           |   |
|             | <b>Other equivalent makes can also be added or deleted, subject to price adjustment if any.</b>                |   |
|             | <b>Wherever makes have not been specified for certain items, the same shall be as per approval of Engineer</b> |   |

## TECHNICAL SPECIFICATIONS

### PHE & FIRE FIGHTING WORKS

#### 1.00 PLUMBING & SANITARY INSTALLATIONS

- 1.01 Special condition for PHE work: The plumbing work shall be carried out by specialized plumbing agency who has licensed plumber and experience of similar works. For supervising the plumbing work at least one engineer who has rich experience in executing plumbing work shall be engaged full time. Approval of specialized agency shall be obtained from HSCC.
- 1.02 The provision of adequate sanitary and safety facilities as per the norms of NBC and good engineering practice shall be compliance during construction for construction workers and staff.
- 1.03 The water use for construction shall be suitable for the same and should be used efficiently and checks and control valves shall be provided to avoid the wastage and leakage.
- 1.04 To reduce the water consumption of the building, the flushing system of water closet shall be of dual flushing cistern type and plumbing fixture shall be provided which require GRIHA compliance for low flow rate.
- 1.05 Lab service related to plumbing & fire fighting will be executed by specialized agency who has experience of carrying out similar work earlier. All the lab item shall be detailed out & redesign as per requirement of client , WHO, CDC norms, items given in BOQ are indicative but covered the cost as per the latest requirement of client , WHO, CDC and required approval of client before execution.

#### 1.06 Wall Caps

Wall caps shall be provided on all walls, floors, columns etc. wherever supply and disposal pipes pass through them. These wall caps shall be chromium plated brass snugly fittings and shall be large enough to cover the puncture properly and shall conform to IS: 4291.

#### 1.07 Pipes, Hangers, Brackets, etc.

Sturdy hangers, brackets and caddles of approved design shall be installed to support all pipe lengths, which are not embedded over their entire runs. The hangers and brackets shall be of adjustable heights and painted with red oxide primer, and two coats of enamel paint of approved make and shade. Clamps, coils and saddles shall be provided to hold pipes with suitable gaskets of approved quality. The brackets and hangers shall be designed to carry the weights of pipes safely. Wherever required pipes may run along ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as follows:

|              | Vertical | Horizontal |
|--------------|----------|------------|
| G.I. Pipes   | 300 cms  | 240 cms    |
| H.C.I. Pipes | 180 cms  | 120 cms    |

#### 1.08 Pipe sleeve

Adequate number of sleeves (pipe inserts) of Cast Iron or Mild Steel shall be provided where pipes cross through concrete, masonry and similar work. The pipe inserts shall be provided with removable timber plugs to keep foreign matter out till installation of the services pipe cross the sleeve. The diameter of sleeve should be one size higher than the proposed dia or as instructed by the Engineer.

#### 1.09 Floor trap inlet

Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, contractor shall have a special type G.I. / M.S. inlet hopper without or with one, two or three inlet sockets to receive the waste pipe. Joint between waste and hopper inlet socket shall be lead caulked/welded/threaded. Hopper shall connected to a C.I. P or S trap with at least 50mm water seal. Floor trap inlet hoppers and traps shall be set in cement concrete 1:2:4 blocks without any extra cost.

#### 1.10 C.P. gratings

Floor trap and urinal trap shall be provided with 110mm square or round C.P. /stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 3 mm.

#### 1.11 Hot Water Supply

The chase will be closed in cement mortar 1:2 ( 1 cement : 2 coarse sand). Pipes shall be clamped to the wall inside the chase.

#### 1.12 Making Connections

Contractor shall connect the new sewer line to the existing manhole by cutting the walls, benching and restoring them to the original condition. A new channel shall be cut in the benching of the existing manholes for the new connection. Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

#### 1.13 Water Heater

Water heater shall be automatic pressure type water heater (with pressure release valve) with heavy gauge copper container duly tinned, thermostats, indicator lamp and glass wool insulator. the water heaters shall be fitted with pressure release valve, non-return valve and inlet and outlet stop valves as required. Water heaters to conform to IS: 2082, in case the solar hot water has also provided in the building the supply of same shall be connected to inlet of water heater.

#### 1.14 FULLWAY BALL VALVE

The valves shall be of full-bore type and of quality approved by the Engineer. The body and ball shall be of copper alloy and stem seat shall be of Teflon.

- 1.15 CPVC PIPES: CPVC pipes shall be used in the internal water supply if specified in the Bill of Quantities. These may required to be connected to the existing/ new GI pipes. The pipe and fitting approved make solvent shall be used as per approved manufacture specification.
- 1.16 SAMPLE AND SHOP DRAWINGS;  
All plumbing items shall be provided as per approved sample/data sheet approved by the HSCC. Before placing the order, the contractor shall submit the shop drawings prepared based on tender drawings and BOQ alongwith samples for approval of HSCC. The shop drawings shall have all the details. The contractor has to obtain the approval of external plumbing drawings from DJB/MCD before start of work.
- 1.17 SS pipe: The SS pipe shall be provided in lab. And specific water supply as per drawings and BOQ. The jointing shall be press type fittings with S-C contour in accordance with DVGW regulation W-524 with fittings for payment only centre to centre total length of composite pipe and fitting shall be measured. A press joint is made by mechanical deformation of the tube and fitting means of special hydraulic tool and cutting of pipe shall also be carried by later cutting tools by authorized agency. An elastomer o-ring is inserted in the recess at the end of the fitting for sealing. When the joint is made, the cross section of the tube becomes hexagonal. A calibration tool is used to ensure that the joint made is up to standard, Clearances from wall, floor and ceiling should be allowed for making the joint refer to the manual of the press tool for clearance requirements.

## **2.00 BORE WELLS**

### **2.01 Scope of Work**

The general character and the scope of work to be carried out under this contract are illustrated in the following specifications. It gives only general guidance as regards design, drilling and construction of tubewells. Before selecting the method of construction to be adopted ,the contractor shall give due consideration to site condition and Geological data of the site. The construction and testing of tubewells shall be as per IS 2800- 1979 (Part 1 and 2). This contract is an item rate contract. All payments shall be made for the actual work executed. The Contractor shall ensure the required minimum yield. The work shall be carried out as per BOQ item. The details which are not available in BOQ, the details of technical specification are to be adopted.

### **2.02 Selection of Site**

The site where the tubewell is proposed, shall be examined by tenderer, and changes if required shall be discussed with the engineer prior to start of work. Any previous data available with the Contractor regarding nearby tubewells should be made use of to evolve suitable procedure for drilling , developing, testing etc.

### **2.03 Geological Data**

During the drilling operation, contractor shall collect the samples of different strata from suitable intervals or where change in strata is met with. It shall be carefully

examined and analysed and the data shall be preserved carefully and handed over to Engineer. The contractor shall make one drilling time log during the execution of work for the bore well.

#### **2.04 Design and lowering of pipe assembly**

The length and diameter of the housing pipe shall be selected on the basis of static water level, the drawdown and the discharge expected from the well and the size of the pump to be installed. The size and length of blind pipes and the slotted/ strainer pipes shall be selected according to the expected discharge and the depth of tubewell. The size and distribution of the slots shall be as per IS 8110. After completion of the bore hole the contractor shall assemble the tube well assembly according to the water bearing strata met during boring, after getting the same approved from the Engineer and shall lower in to the drilled hole the same keeping the slotted strainer opposite to water bearing strata from which the water is to be extracted . The bail plug shall rest on firm ground. Before the bail plug is lowered, about one metre depth of the bore hole shall be packed with the gravel to avoid sinking of the assembly. In case part of a bore hole is not proposed to be utilized, it shall be filled with gravel before lowering the assembly. The slotted pipe and other pipes shall be provided with proper guides to keep them in the centre of the bore to ensure uniform gravel packing all around.

#### **2.05 Gravel Packing**

All gravel shall consist of hard rounded particles reasonably uniform in diameter and shall be of size, determined after analyzing the character of the water bearing formation tapped. The gravel shroud around the screen shall be uniform. It should be free from dust, dirt and other vegetable matters. Gravel packing once started shall be carried out continuously until it is completed. Pea gravel/Stone Chips shall be thoroughly washed.

#### **2.06 Development of Borewell**

The well shall be developed either by surging and agitating or by over pumping and back washing with an air lift and high velocity jetting. The tube well shall be developed as per IS 2800 -1979 or latest by air compressor to be arranged by the contractor as required and stipulated in BOQ to obtain the maximum discharge available from the completed tubewell. Another acceptable method may also be adopted. This development process shall be continued until the stabilisation of sand and gravel particles has taken place. The development shall continue until the gravel should stop sinking, discharge of depression ceases to improve and the sand content is not more than 20parts per million. A record of the hours of working of Air compressor shall be maintained by Employer Engineer which will be signed by the contractor or his authorised representative. Payment for development of tubewell shall be made at the hourly rate indicated in the schedule of quantities for the actual period during which the Air-Condition has worked. A statement showing the quantity of gravel initially filled in the bore and the quantity added during development should be prepared by the contractor and got signed by the representative of the Engineer.

#### **2.07 Disinfection**

The well shall be disinfected after completion of test for yield. All the exterior parts of the pump coming in contact with the water shall be thoroughly cleaned and dusted with powdered chlorine compound. In fact it shall be disinfected every time a new pump is installed or the one installed is replaced after repairs.

The stock solution of chlorine may be prepared by dissolving fresh chlorinated lime. For obtaining an applied standard concentration of 50 ppm, 1 litre of the stock solution shall be used to treat 300 litres of water.

## **2.08 Grouting and sealing**

Grouting and sealing of tubewell may be done, if required depending upon the site conditions and the quality of the discharge of the strata encountered. To ensure that the grout shall be provided a satisfactory seal, it shall be applied in one continuous operation. Sealing of the tube well may be done by grouting the annular space between bore and the housing pipe, with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 : coarse aggregate 20 mm nominal size) to a depth of 5m below the grouted level.

## **2.09 Handing over of the borewell.**

The tubewell shall be handed over in complete shape. The housing pipe shall be closed by a well cap for the period between the completion of the tube well and the installation of the pump set.

The following information shall be furnished by the drilling agency on completion of the tubewell :

- a) Strata chart of the tube well indicating the different types of soils met with, at different depths.
- b) Samples of strata collected , neatly packed and correctly marked in sample bags.
- c) Chart of actual pipe assembly lowered indicating the size of pipes, depth ranges, where slotted/ strainer pipes have been used, depth and diameter of housing pipe, reduced level of the top of the housing pipe and the diameter and depth of the bore hole.
- d) Position of every joint in the well assembly.
- e) Hours of development done by the compressed air, pump sets or by other means.
- f) Pumping water level at the developed discharge.
- g) Two copies of test certificates of the water samples results from approved testing agency.
- h) Results of development along with levels of static subsoil water and depth of draw for steady discharge.
- i) Results of mechanical (sieve) analysis of samples of aquifer materials wherever applicable.
- j) Yield analysis and recommendation on the safe pumping yield, pump settings and specifications for suitable pumps etc.
- k) Verticality tests results to be recorded in accordance with IS:2800-1979

## **2.10 TUBEWELL DATA/As per BOQ**

1. Yield required 500 lpm (Sand free delivery from borewell)
2. Bore - 450 mm dia.

3. Approximate depth – 100 metre
4. Assembly - Blind/ Slotted Pipes – 200 mm dia. Upto complete depth.
5. Material – MS Class “C” pipes (Heavy Class)/UPVC pipe as per IS: 12818
6. Verticality – True verticality as per IS – 2800- 1979
7. Packing – Pea Gravel/Stone Chips
8. Developing – Minimum 72 Hrs or till sand free discharge is obtained.
9. Water for drilling – Contractor shall make his own arrangement for water required for drilling purposes as well for development purposes.
10. The design for the tube well indicating the depth range of the aquifer zones to be tapped shall be given after a detailed study of the data collected during drilling operations.
11. All the casings shall be of ERW steel/UPVC- IS 12818(As per BOQ) quality confirming to IS specifications and carry manufacturer’s certificate. The pipes shall have a wall thickness of not less than 7 mm or as per IS 1239. The slotted pipes must have an effective open area of atleast 15% and the slotted size should be 1.6 mm. All pipes shall be painted fresh before lowering. The pipes shall be welded thoroughly all round to prevent leakage and breakage. Centering guides may be used to maintain the verticality of the tube wells which shall be tested in accordance with the norms stipulated in IS 2800.
12. The annular space between the bore well and tube well assembly shall be packed with well-graded pea gravel of good quality, durability and high sphericity.

### **2.11 Guarantee**

On award of the work contractor shall submit a guarantee covering the quality and performance of all material supplied and installed under the contract. This guarantee shall cover each and every material whether manufactured by the contractor or not.

### **2.12 Rate**

The rate quoted for Borewell items shall provide for the cost involved in all the above described operations.

## **3.00 WATER TREATMENT & PUMPS**

### **3.10 SCOPE OF WORK**

Work under this section consists of furnishing all labour, materials, equipment’s and appliances necessary and required to supply, install and commission pumping and water filtration as described hereinafter and given in the schedule of quantities and/or shown in the drawings. Tentative raw water characteristics are given in Appendix-1



### **3.20 GENERAL REQUIREMENTS**

- 3.2.1 All materials shall be new and of the best quality conforming to specifications and subject to the approval of Engineer.
- 3.2.2 All equipment shall be of best available make manufactured by reputed firms.
- 3.2.3 All equipment shall be installed on suitable foundations, true to level and in a neat work-man-like manner.
- 3.2.4 Equipment shall be so installed as to provide sufficient clearance between the end walls and between equipment to equipment.
- 3.2.5 Piping within the pump houses shall be so done as to prevent any obstruction in the movement within the pump house.
- 3.2.6 Each pumping set shall be provided with a valve and a flap type non-return valve on the delivery side.
- 3.2.7 The contractor shall submit the following documents :
- a. Process and hydraulic design calculations for all units.
  - b. Civil, Structural arrangement , design calculations if included in the scope of work.
  - c. Plant layout drawings
  - d. Process flow sheet
  - e. Design Philosophy
  - f. All technical brochures,
  - g. Operation and maintenance manuals and other details of the system offered.
  - h. Equipments listing & list of consumables.
- 3.2.8 The contractor shall supply shop drawings with supporting details for approval from Engineer before procurement of material. The contractor shall also obtain approval from local statutory authority / authorities as applicable at no extra cost.

Four sets of shop drawings shall be submitted for approval showing:

- a. Any change in layout from the contract drawings.
- b. Equipment layout, piping, wiring diagram and instrumentation.
- c. Manufacturer's or contractor's fabrication drawings for any material or equipment.

### 3.2.9 **COMPLETION DRAWINGS**

On completion of the work and before issuance of certificate of virtual completion, the Contractor shall submit to the Engineer. General layout drawings, drawn at approved scale indicating layout of pump house piping and its accessories "As installed ". These drawings shall in particular give the following:

- a. General layout of pump house.
- b. Panels and other equipment location and sizes etc.
- c. Complete Schematic as installed.
- d. Route of all cables and pipes run along with detail sizes and mode of installation.

3.2.10 The contractor shall also include the cost of supply and execution any other item required for the effective functioning of system but not mentioned in schedule of quantities/ specifications.

3.2.11 The contractor shall also arrange for the appropriate training for the clients staff.

### 3.2.12 **PERFORMANCE GUARANTEE**

At the close of the work and before issue of final certificate of virtual completion by the Engineer, the Contractor shall furnish a written guarantee indemnifying the Owner against defective materials and workmanship for a period of one year after completion and handing over. The Contractor shall hold himself fully responsible for reinstallation or replace free of cost to the Owner.

- a. Any defective material or equipment supplied by the Contractor.
- b. Any material or equipment supplied by the Owner which is proved to be damaged or destroyed as a result of defective workmanship by the Contractor.

3.2.13 A tentative treatment scheme is shown in the drawings.

## 4.00 **WATER SUPPLY PUMPS**

4.01 Water supply pumps shall be centrifugal types as given in the schedule of quantities.

4.02 Water supply pumps shall be suitable for clean filtered water, pump shall be single stage pumps with cast iron body and gunmetal/bronze/SS impeller and directly coupled motor suitable for 400X440 volts, 3 phase, 50 cycles A.C. power supply and mounted on single base frame.

## 5.00 **WATER FILTER (MULTI-GRADE)**

Water filters shall be sand/gravel and anthracite pressure filters downward or upward flow type suitable for a rate of filtration given in schedule of quantities.

Filters shall be vertical types of a required diameter, the shell shall be fabricated from M.S. plates suitable to withstand a working pressure given in schedule of quantities. The thickness of shell and of dished ends shall be as per IS: 2825. The filter shall have two-pressure tight manhole cover one at the top and other at side shell portion. Each filter shall be provided with screwed or flanged connections for inlet, outlet, individual drain connections and all other connections necessary and required. Filters shall be rubber lined with 3mm thick non-toxic, non-leaching rubber. Rubber lining to be tested with Spark Tester for pinholes etc. Primary painting of all exposed surfaces to be done.

**6.00 UNDER DRAIN SYSTEM**

Each filter shall be provided with an efficient under drain system comprising of collection pipes, polypropylene nozzles of manufacturer’s design. The entire under draining system shall be provided on M.S. Plate or cement concrete supports provided by the contractor.

**7.00 FACE PIPING**

Each filter shall be provided with interconnection face piping comprising of inlet, outlet and backwash complete with diaphragm valves/ball valves. Piping shall be fabricated from mild steel pipes as per IS: 1239.

**8.00 ACCESSORIES**

Each filter shall be provided with the following accessories:

- a. Air release valve with connecting piping.
- b. 100mm dia Borden type gunmetal pressure gauges with gunmetal isolation cock and siphon on inlet and outlet.
- c. Sampling cocks on raw water inlet and filtered water outlet.
- d. Individual drain connection with ball valves for each filter.
- e. Connections with valve for air scouring.
- f. Rate of Flow Indicators in the raw water inlet line.
- g. Quantity meter in the filter water outlet line

**9.00 FILTER MEDIA**

9.01 Each filter shall be provided with clean and washed filter media, following is recommended.

|                      |                   |              |
|----------------------|-------------------|--------------|
| Coarse Silex Pebbles | 6.0 - 10.0mm size | (150mm deep) |
| Fine Silex Sand      | 1.4 - 2.5mm size  | (600mm deep) |
| Anthracite           | 0.80 - 1.6mm dia  | (600mm)      |

9.02 The above filter media arrangement may be altered to suit contractor's own design for the most efficient performance and also keeping the low height available for the installation of these Vessels.

## **10.0 TEST KITS**

10.01 Provide one test kit with initial requirement of reagents for the following:

Residual Chlorine Indicator

Valve

10.02 Details of equipment with literature shall be supplied with the tender.

## **11.00 VALVES**

11.01 Valves 50mm dia and above shall be of cast iron butterfly valves.

11.02 Non-return valves 80mm dia and above shall be cast iron double flanged conforming to IS: 5312, 65mm and below shall be of gunmetal.

11.03 Valves 50mm dia and below shall be cast iron ball valves with stainless steel SS-304, stem and ball (S.S.304 or brass with hard chrome plating) with Teflon seat.

11.04 Suction strainer shall be of cast iron with S.S. Perforated sheet.

## **12.00 PAINTING AND CLEAN UP**

a) On completion of the installation Contract shall be scrub clean all pumps, piping, filters and equipment and apply one coat of primer.

b) Apply two or more coats of synthetic enamel paint of approved make and shade.

c) Provide painted identification legend and direction arrows on all equipment's and piping as directed by Engineer.

d) All M.S. fabricated items M.S. pipe lines structural, vessels for water treatment plant shall be painted with zinc/chromate primer after through cleaning. On completion of the installation Contractor shall scrub clean all pumps, piping, filters and equipment and again apply one coat of zinc chromate primer.

e) On final completion of the work, contractor shall clean up the site and the pump room, pump room of all surplus material, rubbish and leave the place in a broom clean condition.

## **13.00 MOTOR CONTROL CENTERS**

13.01 Switchboard cubicles of approved type shall be fabricated from 2mm thick CRC sheet with dust and vermin proof construction. It shall be painted with powder coating of approved make and shade. It shall be fitted with suitable etched plastic identification plates for each motor. The cubicle shall comprise of the following (Switchgear as given in the schedule of quantities):

- a) Incoming MPCB of required capacity
- b) Isolation MPCB/MCCB, one for each motor
- c) Fully automatic DOL/Star Delta starters suitable for motor DOL upto 7.5 H.P.; Star/Delta for 10 H.P. and above H.P. with push buttons one for each motor and On/Off indicating neon lamps.
- d) Single phasing preventor of appropriate rating for each motor
- e) Rotary duty selector switch
- f) Panel type ampere meters one for each motor shall be with rotary selector switch to read line currents.
- g) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase
- h) Neon phase indicating lamps and indicating lamp for each motor and on incoming mains.
- i) Rotary switch for manual or auto operation for each pump
- j) Fully taped separate aluminium bus bar of required capacity for normal and emergency supply where specified.
- k) Space for liquid level controllers and other equipment specified separately in the contract/given in the schedule of quantities
- l) The panel shall be pre-wired with colour coded wiring. All interconnecting wiring from incoming main to switchgear, meters and accessories within the switchboard panel. Wiring shall have suitable copper or aluminium ferrules.

13.02 Switchboard cubicle shall be floor or wall mounted type as directed by the Engineer.

#### **14.00 WATER SOFTENING PLANT**

Mild steel pressure vessel complete with dished ends, supporting legs and facing pad for pipe connection, internally rubber lined and externally two coats of red oxide primer and two coats of synthetic enamel paint complete with manhole, cover, frontal pipe work fitted with valves provided with inlet, outlet pressure gauges and sample valves and with frontal pipe work complete with manually. Ball Diaphragm for normal operation and regeneration and hydraulically operated erector, initial charge of resin and internals consisting of distributor, collector and regeneration tank to store and measure chemicals for regeneration.

14.01 Hardness Test Kit

Details of test kit with literature shall be supplied by the contractor at appropriate stage.

**15.00 REVERSE OSMOSIS (R.O.) PLANT FOR PROCESS AND DRINKING WATER**

15.01 On the basis of sample water analysis, the Contractor shall design, supply, erect, test and commission the pre-assembled RO system. The system shall consist of but not be limited to the following:

- a) PP wound Micron Catridge Filters in food grade material in combination of 5 & 10 micron rating or alternatively spring type cross filter with manual/auto backwashing system and shall be provided with necessary isolation valves, inlet & outlet pressure gauges etc. Micron filters shall be with differential pressure measurement system and cleaning frequency should not be more than once in a month.
- b) Anti-scalent and pH correction system as per feed water quality along with process demanding instrumentation and piping etc.
- c) RO module fitted with thin film composite TFC polyimide spiral wound element type membrane of adequate area/size & no. encased in SS housing and all necessary accessories/controls to perform the desired duty. Cleaning frequency shall not be more than once in a month.
- d) High pressure pump for feeding RO system with necessary instruments like high & low pressure switch, pressure gauges and isolation valves etc.
- e) On line panel mounted pH control and conductivity indicators.
- f) Suitable NRV at the outlet of Permeate.
- g) Electric control panel for the system operation consisting of HP Pump starter with overload protection, manual-auto-off operational selector switch, pre-wired instrumentation panel.
- h) Decarbonator unit consisting have packed column of food grade FRP, degasser blower, degassed water tank etc. complete with frontal piping.
- i) MS skid frame mounted cleaning in place system for easy movement with polyethylene tank and accessories.
- j) In-built flushing system for flushing the deposition of concentrate in the membrane during non-operating period of plant.
- k) Electronic type Rotameter for permeate and rejection along with companion flanges.
- l) Dosing system having trip interlocks with HP feed pump to RO membrane to get ripped if the HP pump trips.

- m) Interconnecting piping & strainers etc.
  - n) Low/High pressure cutouts
  - o) Back pressure regulator.
  - p) Pressure gauges of suitable range in 4" dial with SS contact parts.
  - q) Flow meters & control valves
  - r) Level Indicator/Controller in the R.O. Water Storage Tank for automatic shut off/starting of the plant.
  - s) Safety relief valves.
  - t) Instrument & Electrical panel with starter and overload protection.
  - u) TRFC type motor suitable for 415v, 3 phase, 50 Hz AC supply.
  - v) Minimum percentage recovery of the system shall be mentioned (and guaranteed by the Bidder).
  - w) The membrane element shall be suitable for handling 6.5 to 8 pH feed quality and the required service to provide permeate quality of less than 100 ppm TDS. The system shall be provided with stand by cartridge filter arrangement and all parts in direct contact with water in the RO system shall be in SS316 material. The Contractor shall also specify necessary procedure for membrane cleaning along with dosages of chemicals.
- 15.02 Power & control wiring for the feed pumps & R.O. output water transfer Pump will be as per Electrical drawings approved for the system.
- 15.03 Solenoid Valve will be provided at the outlet of RO Module.
- 15.04 Piping shall be as per system requirement.
- 15.05 Complete Scheme, Equipment Layout, P&I Diagram & Electric circuit diagrams shall be got approved from the owner or its authorized representative before execution of work.
- 15.06 Water storage tanks for storage of R.O. treated water:
- To be constructed from FDA approved food grade polyethylene, completely drinking water with built in UV stabilizer, screw able or lockable lid. Inner layer should preferably in white colour.
- 15.07 Following items will also be under Contractor's Scope of Work:
- a) RO Water Storage Tank.
  - b) All inter-connecting Pipes within the system battery limits
  - c) Power & signal cabling & control system within battery limits

15.08 Hydro Test shall be offered at pressure 1.5 times the operating pressure or 5 kg/sq.cm, whichever is higher for all equipment during shop inspection.

15.09 Warranty: Membranes will be warranted for a period of 36 months.

#### **16.00 Automation for Water Treatment & Water Supply System**

Raw water from Tube Wells would be received in the underground Fire Tank (T1) from there it overflows to the underground Raw Water Tank (T2).

There is no consumption of water from (T1) except in case of fire or during trial runs of the Fire Pumps and the above overflowing arrangement is provided to prevent stagnation of Water in Tank (T1).

The Tube Well Pump would be automatically switched on off by Level Controller provided in Tank (T2.) The same Level Controller would give audio/visual alarm in case of reaching very high (HH) or very low (LL) level. (Chlorination to kill bacterial/virus is done in the Filtered Water with a Chlorine Dosing Pump in the line going to OH Tanks.)

Raw Water from Tank (T2) is pumped by Pumps P6 A/B to the Filter Water Tank, after passing through Filter. Raw Water from Tank (T2) is also pumped by Pumps P7 A/B to the Over Head Fire Water Tank (T5) from there it overflows to the Over Head Flushing Water Tank (T6 & T5). Filtered water pump P6 A/B would be automatically controlled by the Level controller provided in tank (T5) and Raw Water Lift Pump P7 A/B would be automatically controlled by the Level controller provided in tank (T6 & T5). These Level Controllers as in earlier cases would also give audio visual/ alarm in case of very high or very low level.

Filter Water from Tank (T3) is pumped by Pumps P8 A/B to the Soft Water Tank, after passing through Softener. Filter Water from Tank (T3) is also pumped by Pumps P9 A/B to the Over Domestic Water Tanks (T7 & T12). Filtered water pump P8 A/B would be automatically controlled by the Level controller provided in tank (T4 ) and Filter Water Lift Pump P9 A/B would be automatically controlled by the Level controller provided in tank (T7 & T12). These Level Controllers as in earlier cases would also give audio visual/ alarm in case of very high or very low level.

Soft Water from Tank (T4 )s pumped by Pumps P10 A/B to the Over Head Soft Water Tank. Soft Water pump P10 A/B would be automatically controlled by the Level controller provided in tank (T8) These Level Controllers as in earlier cases would also give audio visual/ alarm in case of very high or very low level.

Domestic Water from Over Head Domestic Water Tank (T7) shall be go into the R.O. Plant placed on the terrace of super specialty block and from there the RO water would be distributed for bother super specialty block and service block

R.O. Water Plant would be automatically controlled by the Level controller provided in tank (T9) Similarly, R.O. Water Plant on Library Block would be automatically controlled by the Level controller provided in tank (T13) This Level Controller as in earlier cases would also give audio visual/ alarm in case of very high or very low level.



Electric Control Panel containing DOL starters for all the pumps described above would be supplied by the Owner. The Automation System Vendor has to provide interface with the contractors of these Pump Motor Starters. There would be enough empty space in the bottom tier of this Electric Control Panel. However, Automation System Vendor has to provide full details of such relays controllers indication lights/ alarms etc. to the Owner for incorporating there in the Electric Control Panel.

## 17.00 TREATED WATER QUALITY

The out put from Softener shall conform to commercial hardness. Similarly the resultant TDS from RO system shall be less than 100 PPM. Other output parameters from the system shall with in the Desirable limits specified in IS :10500 standards.

### APPENDIX - I

Tentative Raw Water Characteristics:

| S.NO | PARAMETER                         | VALUE           |
|------|-----------------------------------|-----------------|
| 1.   | Hardness                          | 800 mg/l        |
| 2.   | Colour                            | Less than 5     |
| 3.   | Odour                             | Unobjectionable |
| 4.   | Turbidity                         | 4 NTU           |
| 5.   | PH                                | 6.5 to 8.5      |
| 6.   | Total iron                        | 0.1 mg/l        |
| 7.   | Chlorides                         | 250 mg/l        |
| 8.   | Total Dissolved solids            | 1200 mg/l       |
| 9.   | Coliform organisms at 37o C (MPN) | 221 per 100 ml  |
| 10.  | E-Coli                            | 79/100 ml       |

Note : The parameters and characteristics of raw water given are tentative only. The contractor shall on his own collect and assess the nature of water available at the site and has to design the system according to that.

## 18.00 HYDROPNEUMATIC SYSTEM

### 18.01 SCOPE

This section of the contract involves the design, supply, installation, testing and commissioning of the complete Hydropneumatic pumping system and other pumping systems complete with all controls and electrical work for domestic water

supply. All submersible, drainage pumps for the project are also included in this contract. It also involves testing and commissioning of the pumping system with the domestic water and flushing water supply & distribution.

This specification described the particulars of the contract, designs and systems chosen, and mode of operation.

All installation work shall comply with the latest rules and regulations.

The work embraced by this specifications covers the design, submission to authorities, supply, delivery on site, installation, testing, commissioning and maintenance of the Hydropneumatic pumping system, other pumping system installation of the building in accordance with this specification and associated drawings.

The scope of work shall include the following (list is indicative and not exhaustive) :

- Variable speed pumping units domestic water supply & distribution.
- Suitably sized food grade quality, non-toxic diaphragm type pressure vessels complete with necessary interconnections and controls.
- Control panel for pump control complete with variable speed drives, circuit breakers, fuses, pressure transmitters etc. complete with all interconnections to pumps and electrical supply panels.
- Pump control units complete with pre-programmed micro-processorchip.
- Pump monitoring units to monitor operation of pumps.
- Each Hydropneumatic Pumping unit shall be supplied as a complete set including variable speed pumps, pressure vessels suction and discharge common manifolds, non-return valves, isolating valves, pressure transmitters on the discharge side and level electrode at the suction tank. Each unit shall be provided with electronic microprocessors for unit control and all necessary electrical work for the unit.
- Submersible drainage pumps for plant room drainage complete with electrical panels and necessary accessories with automation for pump operation.
- The Hydropneumatic system supplier shall provide the pumping units in the designated pump rooms as complete units included all necessary piping within plant such that only discharge connections are required to be connected into the unit's discharge manifolds just inside the plant room, by the Plumbing tenderer. The Hydropneumatic system tenderer shall guarantee specified pump performance at various pump speeds and Hydropneumatic pumps must be able to supply at least 2 bar pressure at the highest/farthest fitting.
- Electrical equipment and installation work including the PLC in Control panel.

- Painting and labelling of pipework and equipment;
- Provision of all hold down bolts, spigots struts and the like required to be built in during construction;
- Provision of all level switches, flow switches and other sensing devices for status indication.
- All interfacing work with other trades.
- Testing and commissioning and balancing of the Hydropneumatic & Pumping system;
- Provisions of operating instructions and maintenance manuals;
- Provision of spare parts;
- Training of the employer's staff for proper operation of the entire systems;
- Liaison with Local Authorities to obtain all necessary certificates and approvals, including the completion of all submission drawings, forms and payment of any fees and charges. All the costs for all the tests required by Local Authorities shall be included. To attend to any Authorities inspection regardless of whether this inspection is carried out after the defect liability period;
- Provisions of the necessary installation which include pumping works, pipework within the pumping unit up to suction and discharge manifolds, conduit and control wiring, etc. to form a workable system required;
- All other works and systems as specified in the Contract document and or shown on the drawings.
- All cutting, patching, framing up, furring in, chasing and making good associated with the building construction for the passage of pipes, conduits and the like including providing GI pipes sleeves of required size corresponding to pipe dia, wherever pipes crossing fire rated walls and floors and sealing with glass wool in between and fire sealant compound on either end. Details on shop drawings shall also be provided.

## 18.02 GENERAL

Equipment offered for supply and installation shall include the following:

All minor items and incidental work, equipment accessories and materials may not be specifically mentioned but are required for the proper completion of the installations in accordance with the true intent and meaning of this Specification.

Readily accessible, dust-proof lubricating facilities on all moving parts and equipment including provision for cleaning all lubricating lines and bearings and charging same with the correct lubricants after installation but prior to testing and commissioning.

Clearly visible and robust manufacturer's name-plates permanently fitted each and every item of equipment and showing the manufacturer's name, type and/or model number, serial number, and all essential operating data such as speed, capacity, voltage, current draw, etc.

The Tenderer also shall allow provision for the inspection of all plant and equipment by the manufacturer or his licensed representative, at least twice during the course of the installation.

### 18.03 PIPING

The pipes and fittings in the domestic Water Treatment plant room shall be CPVC /GI class 'C' (heavy class) conforming to IS: 1239 ( Part-I) for pipes and IS:1879 (Part 1 to 10) for malleable cast iron galvanized fittings or specified in the BOQ.

## 19.00 PUMPS FOR HYDROPNEUMATIC & DRAINAGE SYSTEM

### 19.10 PUMPS

Pumps shall be vertical, centrifugal, multistage directly coupled to motor. Provision of pump with pump head & base of cast iron and other parts in SS 304 shall be made for pumps required in Hydropneumatic System. Impeller shall be hydraulically balanced and keyed to shaft. Pump shall be mounted on a concrete foundation, projecting at least 15 CM above finished floor level. The pumps base shall be set on a vibration elimination pad. The pump shall be lubricated in strict accordance with the manufacturer's instructions and shall be factory aligned prior to shipment. All motors and bases shall be painted with approved finish shop coat of paint. The pump shall be selected for the lowest operating noise level and shall be complete with flexible connections, valves, and pressure gauges. The pumps shall include cost of foundation channel complete.

The Tenderer shall supply and install pumps of the type and performance as shown on the drawings. All duties of pumps given in the Tender Drawings shall be checked and where necessary corrected before ordering. All the parts of the pumps that are in contact with water e.g. shaft, impeller etc. shall be of stainless steel construction.

Pumps shall be so selected that the design duty point is within 5% of the maximum efficiency point. The pump casing so selected shall have ample space to take an impeller one size larger than that capable of performing the design duty.

Pumps of 2900 rpm with high efficiency and low noise motor can be selected and noise data submitted for approval. All pumps and motors shall be of minimum vibration and noise level during operation. Vibration isolators shall be provided for all pump sets.

Facilities shall be provided to prevent starting of pumps when the water tank is at low water level. An indicator for this low water level alarm shall be provided.

Facilities to select which pump to be duty pump and standby pump shall be provided and be interchangeable.

Pump curves for all pumps offered shall be submitted. All curve indicating excessive shut-off head will not be approved.

Each pump shall be provided with a gate valve at suction and discharge, approved check valve at discharge, approved strainer at suction, flexible connections at pump suction and discharge, eccentric reducer at suction, concentric reducer at discharge, pressure gauges at suction and discharge, circulation relief valve and automatic air relief valve.

Appropriate neoprene vibration isolation mountings shall be provided for each pump sets.

### **19.10.1 Vertical Pumps**

Multi-stage pumps shall be of centrifugal type and arranged with shafts vertically installed. The impellers shall be of stainless steel mechanically balanced and keyed to shaft. Renewable guide rings are to be provided in the casting, keyed to prevent rotation.

Pumps shall be driven by elevated in-line TEFC squirrel cage motors via extended vertical shafted complete with universal couplings.

The shafts shall be stainless steel. Stainless steel sleeves shall be provided to protect the shaft in the water space and through the sealing glands. The sleeves shall be keyed to prevent rotation and secured against axial movement.

The bearings shall be of ball or roller type protected against ingress of water, dirt and other matter.

Vertical multistage pumps shall have universal flanges. Intermediate bearing, support bearing shall be provided in the pump.

The shaft seal shall be easily serviceable and shall allow for correct adjustment and loading of the seal.. Pump motors above 7.5 kW shall be equipped with a spacer coupling which allows changing of shaft seals without removing the motor. The pump motors shall be of Class "F" insulation and IP55 rating and shall be provided with built-in thermistors for protection against over heating.

### **19.20 VARIABLE SPEED HYDROPNEUMATIC PUMPING SYSTEM**

Variable speed Hydropneumatic pumping units shall be provided for supply of domestic water, flushing water supply for the project. The units shall be selected so as to provide at minimum of 2 bar pressure at the

highest/farthest fitting in each plumbing system, the unit serves. The hydrodynamic pumping units shall have the following features;

### 19.20.1 System Description

The system shall be supplied as complete sets including suction and discharge common manifolds, non-return valves, isolating valves, pressure transmitter on the discharge side and electrode at the suction tank.

The system operation will be such that the initial small water demand shall be met by the charged diaphragm pressure vessel. Should the water demand continue the system pressure will dip to a preset pump cut-in point when the lead pump starts to operate at reduced speed through the variable speed drive. However, should the system pressure be still below the preset value, the controller continuously increases pump speed to meet the system demand. When the lead pump is not able to meet the system pressure at full speed, the second pump also starts to operate.

At peak demand all the pumps operate, Similarly, if there is a drop in water demand the duty pump speed starts to reduce, then standby pumps cut-off, followed by stopping of the duty pump.

The closed diaphragm pressure vessel shall be of polyethylene material with a pressure gauge and isolating valve. The interior shall be of non-toxic lining suitable for use with potable water. The vessel shall be manufactured to conform to ASME pressure vessel code/standards.

The system shall be under the control of an electronic microprocessor unit (EMU).

A pressure transmitter shall detect the pressure at the delivery manifold and feedback to the microprocessor control panel via control circuit.

The system shall incorporate a frequency converter or frequency converter motors on the pumps and the pressure transmitter shall register the actual pressure on the discharge side.

The variable speed drive pumping system shall maintain a constant pressure regardless of the system demand. If there is a drop in pressure outside the preset point, the Variable Speed Drive (VSD) pump shall start to run until the pressure increases to the preset limit, or it will continue to increase the pump speeds to the upper limit of the frequency. If the water system demand still cannot be met, the second pump shall be called in to run, the VSD will then alter the pump speed to meet the preset pressure point. If the set point is still unable to be met, the third pump is then activated to run (in case of 3 pumps units).

This shall be achieved by continuously varying the motor speed of the duty pump according to the demand up to a maximum designed capacity.

Under decreasing hydraulic demand the reverse sequence to the above description shall apply.

The EMU shall ensure alternation of all the duty and standby pumps for even running hours for all the pumps.

The frequency converter shall be linked to the motor of the duty pump for continuous speed adjustment and ultimately the water delivery shall be maintained at constant pressure at the preset value.

### **19.20.2 Local Motor Control Panel**

The motor control panel shall be equipped with all the necessary electrical components including a microprocessor control unit and a frequency drive. The control panel and the microprocessor shall cover the followings functions:

- Flexibility and simplicity in allowing the necessary re-adjustment of the pumping system pre-set delivery pressure to operate the pumps within the specified maximum and minimum delivery ranges.
- Built-in frictional loss compensation factor which will automatically increase the delivery pressure setting, in collaboration with the increase in flow demand. This shall be able to minimise the system pressure differences and provide a more constant pressure along the supply line and also to save the energy consumption of the motor when running at low speed.
- Automatic changeover of the pumps to be controlled by the microprocessor which dictates the duty and standby pumps to run at variable speed.
- Built-in clock functions with weekly programming and with switch on system to operate at at least 10 different pre-set pressure points as required.
- When the system has not been operated for more than 24 hours, it shall automatically start the pumps for a few seconds/day to ensure the pumps readiness at all times. The standby pumps shall be activated upon failure of duty pump(s). In event of control failure, the pumps shall be able to be start/stopped manually at the local panel by means of pressure switches.
- The microprocessor control panel shall be able to cut-off the pumping system when excess pressure is registered in the discharge common manifold.
- The system shall have the capability of receiving input signal concerning reduced water level in suction tanks and shall have control mechanisms to prevent the pumps form running dry.
- Automatically starting the pumps when the water level is back to normal.
- In case of pump failure due to motor overload, the standby pump is switched on automatically. Alarm signal is displayed on the LCD Display unit and alarm lights are activated.
- Functions to limit the no. of start/stop of pumps per hour.

- The system control panel shall incorporate at least the following components:
  - a. LCD Display
  - b. Pumps selections for up to 4 pumps so that system controller can control up to 6 pumps
  - c. Pump status button to display duty pump speed and system capacity
  - d. Zone status button to display operating parameters for different pumping units
  - e. Setting button to input preset pressure, system start/stop time etc.
  - f.  $\pm 1$  button to key in numeric data such as pressure set point, etc.
  - g. Enter button for confirmation of input into the system
  - h. Alarm button to show location of fault - self diagnostic function display
  - i. Hour Run measurement for each supplied pumpset
  - j. Buttons for scrolling to select the actual display reading for system configuration, i.e. up and down scroll concept.
  - k. Necessary devices for programming, supervising and monitoring operation data/system, status shall be incorporating into the control panel.

### 19.20.3 Operations

Local control panel shall perform as follows:

#### Auto mode

The desired delivery pressure within the range specified shall be set at the duty local control panel. The pressure transmitter shall detect the delivery pressure continuously within 1 second and feedback to the microprocessor which will control the variable speed drive frequency converter for speed control of the duty pump. When demand increases, the subsequent pumps in the system will be activated to boost up the pressure. Ultimately the duty pump set shall be operated fully automatically to maintain the delivery pressure constantly at the desired set value.

#### Manual Mode

The on/off function of the pumps shall be manually adjusted at the microprocessor located at the local control panel.

#### Frequency Control By-pass Mode

All the pump sets shall be started/stopped automatically with the pump output at fixed maximum rotational speed. All the control and protection



functions shall remain active. The cut in/cut out pressure shall be internally calculated by the microprocessor for each pump.

#### **19.20.4 System Features**

The required performance features of each Hydropneumatic pumping unit shall be as follows:

- a. System Configuration
- b. Variable speed pumps with pressure vessels.
- c. Control panel consisting of the following components:
  - Pump Functional Unit (PFU) - control unit c/w pre-programmed microprocessor chip. This unit shall control all pumping unit operations through electronic controller.
  - Pumping Monitoring Unit (PMU) - monitor the operation of the pumpsets. This unit shall allow for monitoring and setting of all control parameter.
  - Variable Speed Drive
  - Circuit Breakers
  - Fuses
  - Pressure Transmitter

#### **Set Point**

Ten separate pressure “set points” shall be able to be programmed into the PMU, and switching between set points is timed by a real time clock when a lower pressure is acceptable during certain periods, for instance after hours or weekends, the set point shall be lowered to minimise power consumption.

An external input shall also be used to switch between set points, or manually adjust a set point at any time.

#### **Friction Loss Compensation**

It shall be possible to allow for the friction loss component of the system, calculated at full flow and set as a percentage of the set point which will reduce the working pressure of the pump set depending on the actual no. of pumps in operation. A linear approximation of system resistance curve can therefore be allowed for, and pressure will automatically increase as system flow and subsequent frictional losses increase. As such power consumption shall reduce which is required for the pumping system.

#### **Displays**

Through the PMU keypad all variable parameters shall be adjustable, current status of settings and measured values shall be able to display on the 2 line x 24 character liquid crystal display.

Individual menus shall be available for monitoring individual pumps, zones, settings, alarms and ON/OFF functions.

### **Pump Status**

Running hours of each pump  
Actual pump status (running, not available, standby, allocated to zone, fault)  
Maximum head of pump at zero flow.

### **Zone Status**

This menu shall be the main operating menu where at the setting and operating parameters can be viewed,

Current operating set point  
Measured values in the system  
Operating capacity in terms of total output  
Mode of operation for the zone  
Clock programs (relating to set point pressures)  
Standby pumps  
Pump change over time  
Zone configuration  
Pressure transducer scaling  
Friction loss compensation  
Pump priority  
Inlet pressure measuring (if required)  
System response times  
Allowable number of starts per hour for the pumps  
Minimum limit (loss of water, burst mains protection)

### **Setting Menu (Set)**

In this menu all parameters for the operation of the pump set shall be able to be adjusted as required.

- a. Set points (up to 10)
- b. On/Off function (used to prevent unnecessary cycling at low demands)
- c. Displayed pressure units (Bar, PSI, mBar, kPa)
- d. Real time clock programming for any time of the day, week, or weekend
- e. Zone configuration
- f. Friction loss compensation

### **Alarm**

The alarm menu shall display all faults that occur during operation, logging the time and date of when the fault occurred and when it was corrected, or whether it is still an actual fault, up to 10 faults can be maintained as history

in the controller. The following type of faults shall be diagnosed by the controller.

- a. Mains failure
- b. Frequency converter fault
- c. Analogue input (pressure transducer) fault
- d. High discharge pressure fault
- e. Low discharge pressure fault
- f. Motor thermal overload fault

### **Variable Frequency Drive**

Variable frequency drive shall be of a reputable make acceptable to Project Manager and shall be complete with RFI filter and harmonic dampers.

### **Enclosure**

An IP 54 powder coated steel enclosure shall house all the electrical components.

The enclosure can be supplied loose for remote mounting, or mounted on a common base with the pumps, it shall be adequately ventilated for use in conditions up to a maximum ambient temperature of 45 degrees Celsius.

### **Electrical Componentry**

All circuit breakers, thermal overloads and contactors shall be of reputable make acceptable to the architect. Electrical supply to the pump controller shall be protected using an isolating circuit breaker.

### **Method of Starting**

The panel shall be built to start the pumps in suitable starting modes, i.e. D.O.L., Star/Delta, or using Soft Starters.

### **Quality and Testing**

Manufacture of the pumps, plus design and assembly of the complete packaged Hydropneumatic pumping system shall be factory assembled and the pump station shall be fully tested hydraulically and electrically prior to dispatch to site. Test reports etc. shall be submitted for review before dispatch.

#### **19.20.5 Pump Pressure Vessel**

Diaphragm type pressure vessels shall be provided as shown on the drawings. They shall be incorporated into the system so that during normal operation the pump shall not need to be start within 30 seconds of it switching off in order to prevent the pump hunting.

The pressure vessel shall be of adequate capacity to accommodate a considerable fluctuation in water demand by the system with minimum start/ stop cycles of the pumps. The vessel shall be constructed of steel

plate built to ASME Standards for Unfired Pressure Vessel. A rubber diaphragm shall be provided in the vessel for separating the water and pre-charge nitrogen. The pre-charge pressure shall be adjustable and charging port with non-return device shall be provided. The adjustable cut-in and cut-off pressure unit for the pumps shall be built-in at the vessel to suit the system.

#### **19.20.6 FLOATLESS TYPE LEVEL SWITCH IN WATER TANKS**

The Tenderer shall supply and install floatless type switch probes in the water tanks as indicated below and shown on the drawings.

Raw Water Tanks at Pump Room

- High level alarm (over-flow);
- Low level alarm;
- Low level cut-out for raw water pumps;
- Earthing probe.

Cooling Tower Make-up

- High level alarm (over-flow);
- Low level alarm;
- Low level cut-out for supply pumps;
- Earthing probe.

Potable Water Tank

- High level alarm (over-flow);
- Low level alarm;
- Low water level cut-out for the domestic hydropneumatic pumps;
- Earthing probe.

Each probe shall be of the correct length for the particular application and tank location. Electrodes shall be of polished stainless steel 20 mm OD. Electrode holders shall be weatherproof in all respect.

The earthing probes shall be connected and wired to the building earth systems of the building.

Each set of electrodes shall be installed inside a 230 mm diameter PVC pipe acting as a wave barrier.

The level switch set shall operate with a stepped down voltage at 24V maximum. Stepped down transformers shall be provided for each set of control probes and shall be installed inside centralised control cubicles inside pump room.

Mechanical steel stuffing boxes shall be used.

Control of Duty / Standby Pumps

Operation of the duty and standby pumps shall be carried out by the following method:

- a. Automatically by means of pressure sensor (i.e. pressure switches);

- b. Manually by means of a local start/stop push buttons on pump local motor control panel and emergency stop switch.

The pressure switch shall be installed next to the manual release valve. When the pressure drops to the pre-determined level, a signal will be sent to the pump local motor control panel to start the pump.

Automatic controls shall be operated by electronic, floatless type level switches.

#### Pump Indicator

The following audible and visible indication shall be provided at the pump local control panels as applicable:

- a. Red "overflow level" indicator with buzzer for the associated water tanks;
- b. Amber "extra high water level" indicator for the associated water tank;
- c. Amber "high water level" indicator;
- d. Amber "low water level" indicator;
- e. Red "pump trip" indicator for each pump;
- f. Green "pump on" indicator for each pump;
- g. "Pump electrical supply healthy" indicator for each pump;
- h. Amber "remote/local" status indicator.

## **20.00 FIRE FIGHTING SYSTEM**

### **GENERAL**

- 20.01 Work under this contract shall be executed as shown on the drawings and given in the specifications and required at site whether explicitly shown or not.
- 20.02 Not-with standing the sub-division of the documents into separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and in to the contract so far as it may be practicable to do so.
- 20.03 Where it is mentioned in the specifications that the contractor shall perform certain work or provide certain facilities, it is understood that the contractor shall do so without any extra cost to the Employer/HSCC.
- 20.04 The material, design and workmanship shall satisfy the local fire regulations. The job specifications contained herein and codes referred to where the job

specifications stipulate in addition to these contained in the standard codes and specifications, these additional requirements shall also be satisfied.

- 20.05 Portable fire extinguisher shall be provided in the building as per BOQ which should not contain halogen to minimize the use of ozone depleting substance as per GRIHA.

## **21.00 SCOPE OF WORK**

- 21.01 Work under this contract consist of furnishing labour, materials, equipment and appliances necessary and required to completely do all works relating to the fire protection system as described here-in-after and shown and the drawings, consisting of:

- i) Supply, installation, testing and commissioning of:

Fire hydrant system including fire pumps and ancillary equipment's described later in the Volume.

Fire sprinkler system, as described later in the volume.

Portable Fire Extinguishers

- ii) Preparation of plans and getting pre-installation approval by the Local Fire Authority.

Getting tested by and approval of the installation by the Local Fire Authority during the fabrication/construction stage as well as after completion. It will be the responsibility of the Contractor to get all approval and completion certificate from the Local Fire Department without which the work will not be taken over by the owner. Fee payable to the local bodies for such activities shall be borne by the Owner on production of receipts for money paid and the all other expenses barring the fee will be borne by the Contractor.

- iii) Supply of necessary spare parts during the commissioning stage.

- iv) Supply of any other item or services not specifically mentioned anywhere but required by the Local Fire Authority or essential for the completion & operation.

## **22.00 INTERPRETATION**

- 22.01 In interpretation of specifications, the following order of decreasing importance shall be followed:

- a. Statutory Rules & Regulation
- b. Schedule of quantities
- c. Additional specifications
- d. List of approved make of materials

e. General rules and conditions

22.02 Matters not covered by the specifications given in this contract, as a whole shall be covered by relevant and latest CPWD specifications / Indian Standard Codes. If such codes on a particular subject have not been framed, the decision of the engineer shall be final and binding.

### **23.00 SPECIFICATIONS**

23.01 Work shall be carried out strictly in accordance with the specifications attached to the tender.

23.02 Works not covered in the specifications shall be carried out as per relevant latest CPWD specifications/ Indian standard Code of practice specifications of materials.

### **24.00 EXECUTION OF WORK**

24.01 The work shall be carried out in conformity with the contract drawings and within the requirements of architectural, HVAC, plumbing, electrical, structural and other specialized services drawings.

### **25.00 TENDER DRAWINGS**

25.01 For guidance of the bidder, drawings as listed are enclosed with these tender documents. These drawings are broadly indicative of the work to be carried out. The Contractor on award of work will furnish shop drawings based on the working drawings issued to him, as required in advance for approval of Engineer and get the same approved by Local Fire Authority/other statutory bodies. No claim whatsoever shall be admissible on account of changes that may be introduced by the Engineer /Local Fire Authority.

25.02 The Contractor shall examine all specifications, tender conditions and drawings before tendering for the work.

25.03 Information, levels and dimensions given in the tender drawings are supposed to be correct but the contractor shall make independent inquiries and verify the same. No claims for extras shall be admissible in case of any deviations for incorrectness of the information, levels or dimensions.

25.04 The contractor shall obtain all information relating to the local regulations, bylaws, and application of any and all laws relating to him work or profession. No additional claims shall be admissible on this account.

### **26.00 SHOP DRAWINGS**

26.01 The Contractor shall prepare and furnish all shop drawings in quadruplicate at no extra cost for approval by the Engineer before commencing fabrication/manufacture of the equipment. Such shop drawings shall be based on the Architectural & Fire fighting drawings and requirements laid

down in the specifications and as per site conditions. The manufacture of equipment shall be commenced only after the shop drawings are approved in writing by the Engineer. Such drawings shall be co-ordinated with all disciplines of work.

- 26.02 Contractor shall verify all dimensions at site and bring the notice of the HSCC any or all discrepancy or deviations notices. The decision of the HSCC in the regard shall be final.
- 26.03 Large size details and manufacturer's dimensions for materials to be incorporated shall take precedence over small-scale drawings.
- 26.04 All drawings issued by the consultants for the work are the property of the Consultants and shall not be lent, reproduced or used on any other works than intended, without the written permission of the Consultants.
- 26.05 Working drawings shall be approved by the consultant. Four sets of shop drawings shall be submitted for approval showing:
- a) Any change in layout from the contract drawings.
  - b) Equipment layout, piping, wiring diagram and instrumentation.
  - c) Manufacturer's or contractor's fabrication drawings for any material or equipment.

## **27.00 COMPLETION DRAWINGS**

On completion of the work and before issuance of certificate of virtual completion, the Contractor shall submit to the Engineer. General layout drawings, drawn at approved scale indicating layout of pump house piping and its accessories "As installed ". These drawings shall in particular give the following:

- a. General layout of pump house.
- b. Panels and other equipment location and sizes etc.
- c. Complete Schematic as installed.
- d. Location of Hydrants, Earth pipes, route of earthing conductors etc.
- e. Route of all cables and pipes run along with detail sizes and mode of installation.

## **28.00 DOCUMENTS**

The Contractor shall submit to the Engineer, the following documents on completion of the work and before issuance of virtual completion.

- i. Warranty for equipment installed.
- ii. Test certificates.



- iii. History sheets of the equipments.
- iv. Catalogues.
- v. Operation and Maintenance manuals.
- vi. List of recommended spares and consumables.
- vii. Reconciliation statement.
- viii. All approvals and sanctions.

## **29.00 MATERIALS**

- 29.01 All materials used on this work shall be new, conforming to the specifications.
- 29.02 Materials shall conform to the technical specification and/or the latest CPWD Specifications /Indian Standards Specifications as amended up to date and carry certification mark, wherever so required.
- 29.03 Only approved make of material shall be used. The contractor shall get the samples of all the items approved from the Engineer before commencing the supply.

## **30.00 TESTING OF MATERIALS**

- 30.01 Contractor shall be required to produce manufacturer's test certificates for the particular batch of materials supplied to him. The test carried out shall be as per the relevant CPWD specifications/Indian Standards.
- 30.02 Any weights of sizes given in the tender having changed due to metric conversion, the nearest equivalent sizes accepted by Indian Standards shall be acceptable without any additional cost. The decision of the HSCC shall be final and binding on the contractor.
- 30.03 The Engineer shall have full power to get any material of work to be tested by an independent agency at Contractor's expense in order to prove the soundness and adequacy.

## **31.00 INSPECTION AND TESTING**

- 31.01 All equipment shall be inspected and tested as per an agreed quality Assurance Plan before the same is packed and dispatched from the Contractor's Works. The Contractor shall carry out tests as specified/directed by Engineer.
- 31.02 Contractor shall perform all such tests as may be necessary to meet requirements of Local Authorities, Municipal or other statutory laws/ by-laws in force. No extra shall be paid for these.

- 31.03 The Engineer may, at his sole discretion, carry out inspection at different stages during manufacturing and final testing after manufacturing.
- 31.04 Approvals or passing of any inspection by the engineer or his authorized representative shall not, however, prejudice the right of the Engineer to reject the plan if it does not comply with the specification when erected or give complete satisfaction in service.
- 31.05 All materials and equipment found defective shall be replaced and the whole work again tested to meet the requirements of the specifications, at the cost of the contractor. Contractor has to obtain a performance certificate/approval for the complete layout of piping/equipment erected.

## **32.00 WELDING**

- 32.01 The welding procedure, types of electrodes etc. shall be in accordance with the following IS specifications.
- Welding Procedures IS: 823
- Welding Electrodes IS: 814, but of approved makes only
- Testing of Welders IS: 817
- 32.02 Only Welders fulfilling the requirements of IS: 817 and approved by the HSCC shall be employed by the Contractor.

## **33.00 JOINING MATERIAL (GASKET)**

Gasket, for use in between flanged joints, to be of CAF as per IS-2712, thickness as specified in S.O.Q.

## **34.00 PAINTING**

- 34.01 All above ground pipes, pipe fittings, hose cabinets structural steel work pipe supports etc. shall be painted as per specifications given below.
- 34.02 Painting shall be done only after the completion of fabrication work and testing.
- 34.03 The instructions of paint manufacturer shall be followed as far as possible otherwise the work is to be done as directed by the HSCC.
- 34.04 All cleaning materials, brushes, tools and tackles, painting, material etc. shall be arranged by the Contractor at site in sufficient quantity.
- 34.05 All rust, dust shall scales, welding slag or any other foreign materials shall be removed fully so that a clean and dry surface is obtained prior to painting. Any other oily containment shall be removed by use of a solvent prior to surface cleaning.
- 34.06 First coat of primer paint must be applied by brush on dry clean surface immediately or in any case within 3 hours of such cleaning.

- 34.07 Primer paints - one coat (minimum thickness 100 microns) self-priming epoxy mastic.
- 34.08 Finishing coats:
- a) For Pump Rooms - 2 coats (thickness minimum 50 microns each) of epoxy paint, fire red shade as per IS: 4.
  - b) For other than Pump Rooms - 2 coats of synthetic enamel paint, fire red shade as per IS: 4.

### **35.00 COATING WRAPPING FOR UNDERGROUND PIPES**

- 35.01 All underground piping shall be protected by coating and wrapping as per the following procedure.
- 35.02 The materials and workmanship shall in general conform to IS: 10221, 1982 or as directed by the HSCC.
- 35.03 Cleaning - The pipes shall be thoroughly cleaned by dust, rust will scales, oil, grease etc. by stiff wire brush and scrappers. The surface shall be coated with the primer immediately after cleaning.
- 35.04 Priming - Suitable primer shall be applied as an undercoat. The manufacturers recommended procedure would be followed for applying the primer.
- 35.05 Paste Application - Paste shall be applied to fill up uneven surfaces in order to ensure smoothness for subsequent wrapping with multi-layer tape.
- 35.06 Tape Wrapping - The tape is to wrap while the second coat of primer is still tacky. Winding is to be done with 50% overlap so that the total thickness of 2.0mm tape would become 4.0mm. It should be ensured while wrapping that air bubbles are not trapped. The ends of tape shall be secured with nylon binding to ensure that the tape doesn't get loosened while handling.
- 35.07 The total thickness including 2 coats of primer, 50% overlap of tape etc. should not be less than 4.5mm or as per manufacturer recommendations.
- 35.08 The 'Holiday Test' is to be conducted as per IS: 10221 for detecting any entrapped air or any other defect. The Contractor is to arrange for the Holiday Test and to rectify the defects if found any.

### **36.00 TRAINING OF DEPARTMENT PERSONNEL**

- 36.01 The Contractor shall train the Owner's personnel to become proficient in operating the equipment installed. Training shall be done before the expiry of the defects liability period.
- 36.02 The period of training shall be adequate and mutually agreed upon by the Engineer and Contractor.

- 36.03 The Owner's personnel shall also be trained for routine maintenance work and lubrication, overhauling, adjustments, testing, minor repairs and replacement.
- 36.04 Nothing extra shall be paid to the Contractor for training Owner's personnel.

### **37.00 PERFORMANCE GUARANTEE**

At the close of the work and before issue of final certificate of virtual completion by the Engineer, the Contractor shall furnish a written guarantee indemnifying the Owner against defective materials and workmanship for a period of one year after completion and handing over. The Contractor shall hold himself fully responsible for reinstallation or replace free of cost to the Owner.

- a. Any defective material or equipment supplied by the Contractor.
- b. Any material or equipment supplied by the Owner which is proved to be damaged or destroyed as a result of defective workmanship by the Contractor.

### **1102 SPECIFICATIONS FOR PUMPS AND ANCILLARY EQUIPMENT**

#### **38.00 SCOPE OF WORK**

38.01 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically/diesel engine operated pumps for fire hydrant installations as required by the drawings and specified hereinafter or given in the schedule of quantities.

38.02 Without restricting to the generality of the foregoing the pumps and the ancillary equipment and shall include the following:

Electrically/diesel operated pumps with motors/diesel engine, base plate and accessories.

Pump suction and delivery headers, valves, air vessel and connections.

- a) Alarm system, Pressure gauges/Pressure switch.
- b) Electrical switchboards, wiring, cabling, cable tray, control panel and properly connecting to earthing system of the Factory.
- c) Foundations, vibration eliminator pads and foundation bolts.

#### **39.00 GENERAL REQUIREMENTS**

39.01 Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.

- 39.02 Pumps and motors shall be truly aligned with suitable instruments.
- 39.03 All pump connections shall be standard flanged type with appropriate number of bolts.
- 39.04 Manufacturer instructions regarding installation connections and commissioning shall be followed with respect to all pumps, switchgear and accessories.

#### 40.00 QUALITY CONTROL

- 40.01 These shall comply with the IS Codes as specified.

#### 41.00 SUBMISSIONS

- 41.01 Product Manuals
- 41.02 Hydraulic Details

#### 42.00 STORAGE

These shall be stored as delivered in original packings.

#### 43.00 FIRE AND JOCKEY PUMPS

- 43.01 Pump Sets

- i) Centrifugal, split casing, horizontal pump should be selected as per IS. Pump should have following specification.  
Materials of Construction

|                |  |
|----------------|--|
| PARTS          |  |
| CASING         | CAST IRON                              |
| IMPELLER       | SS/BRONZE IS:318, GR.LTBJ/LTB 2 SS-410 |
| CASING WEARING | CAST IRON                              |
| SHAFT          | STAINLESS STEEL                        |
| SHAFT SLEEVE   | SS-410                                 |
| SHAFT SEAL     | MECHANICAL                             |
| THRUST BEARING | ANTI-FRICTION OF TITLING PAD TYPE      |

- ii) Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced dynamically and statically.
- iii) The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.

- iv) Pumps shall be provided with approved type of mechanical seals.
- v) Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.
- vi) The pump shall meet the requirements of the Tariff Advisory Committee and the unit shall be design proven in fire protection services.
- vii) Pumps shall be provided with pressure gauge with isolation cock on the delivery side.
- viii) In case of motor driven pump the motor rating should be adequate to drive the pump at 150% of rated discharge.

Waterproof PVC coated windings.

#### 43.02 Electric Drive

- i) Electrically driven pumps shall be provided with totally enclosed fan cooled induction motors. For fire pumps the motors should be rated not to draw starting current more than 3 times normal running current.
- ii) Motors for fire protection pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.
- iii) Motors shall be wound for class B insulation and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fibre insulated.
- iv) Motors for fire pumps shall meet all requirements and specifications of the Tariff Advisory Committee.
- v) Motors shall be suitable for 415 volts, 3 phase 50 cycles a/c supply and shall be designed for 38 deg. C ambient temperature. Motors shall conform to I.S. 324.
- vi) Motors shall be designed for two start system.
- vii) Motors shall be capable of handling the required starting torque of the pumps.
- viii) Contractor shall provide inbuilt heating arrangements for the motors for main pumps to ensure that motor windings shall remain dry.
- ix) Speed of the motors shall be compatible with the speed of the pump.
- x) The fire pumps shall operate on drop of pressure in the mains as given below. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

#### 43.03 Operating Conditions for Fire & Sprinkler Pumps

|  | CUT IN | CUT OUT | REMARKS |
|--|--------|---------|---------|
|--|--------|---------|---------|

|                                |                     |  |   |
|--------------------------------|---------------------|--|---|
| Operating Pressure             | -----               | (10M+Head of pump as per BOQ in M).<br>ie<br>1.0+(H)Kg/Sq<br>m | -----   |
| Jockey Pump                    | (H-0.5)<br>Kg/Sqcm. | H Kg/Sqcm.   | Jockey pump to stop when main fire pumps starts |
| Main Fire Pump (One No )       | (H-1.0)<br>Kg/Sqcm. | Push button manual   | To start by pressure switch No. 2 on air vessel |
| Common Diesel Engine ( One NO) | (H-2.0)<br>Kg/Sqcm. | Push button manual   | To start by pressure switch No. 3               |

#### 44.00 Vibration Eliminators

44.01 Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufacturer details.

#### 45.00 Installation

45.01 Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.

45.02 Pumps and motors shall be truly aligned by suitable instruments.

45.03 All pump connections shall be standard flanged type with appropriate number of bolts. In case of non-standard flanges companion flanges shall be provided with the pumps.

45.04 Manufacturer's instructions regarding installation, connections and commissioning shall be followed with respect to all pumps and accessories.

45.05 Contractor shall provide necessary test certificates and performance charts with NPSH requirement of the pumps from the manufacturer. The contractor shall provide facilities to the Architect or their authorised representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturer's works without any cost to the owners.

#### 46.00 DIESEL ENGINE

46.01 Diesel engine shall be of 6 cylinders with individual heat assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping strainer, isolating and pressure reducing valves, by pass line, exhaust pipe, silencer day tank for fuel all interconnected piping etc. complete in all respects.

46.02 The speed of the engine shall match the pump speed for direct drive.

- 46.03 The engine shall be capable of being started without the use of the wicks, Cartridge heater plugs or either at the engine room temperature 4 deg.C and shall take full load within 15 seconds from the receipt of the signal to start.
- 46.04 The engine shall effectively (i.e. without any derating) operate at 46 deg.C ambient temperature at 150 meters above mean sea level.
- 46.05 Noise level of the engine shall not exceed 90 db (free sound pressure) at 3-meter distance.
- 46.06 The engine shall be self-starting type up to 4 deg.C. It shall be provided with one 24 volts heavy duty D.C. battery, starter, cutout, battery leads complete in all respects. One additional spare battery lead complete in all respects. One additional spare battery shall be provided. The battery shall have an adequate capacity for cold cranking amperage as recommended by the Engine Manufacturer.
- 46.07 An automatic change over system shall be provided so that the spare battery comes into operation in case the engine is not started by its own battery.
- 46.08 Pump Control Panel should have visual and audio alarm and indication for battery failure.
- 46.09 The working battery as well as the spare battery should have output amperage capacity for at least 3 consecutive cranking/starting of the Engine.
- 46.10 Provide a battery charger of sufficient amperage capacity to fully charge the batteries in 20 hours with trickle and booster charging facilities and regulators.
- 46.11 Arrangement for starting shall be automatic on receiving the signal. But shut-off shall be manual.
- 46.12 The engine shall be provided with an oil bath or dry type air cleaner as per manufacturer's design.
- 46.13 Engine shall be suitable for running on high-speed diesel oil.
- 46.14 The system shall be provided with a control panel with push button starting arrangement also wired to operate the engine by differential pressure switches.
- 46.15 The entire system shall be mounted on a common structural base plate with anti-vibration mounting and flexible connections on the suction and delivery piping.
- 46.16 Contractor shall provide one fully mounted and supported day oil tank fabricated from 6mm thick MS sheet electrically welded with capacity for 8 hours working at full load but not less than 200 liters. Provide level indicators - low level and full level in the day oil tank on the control panel through float switches and an air breather. Day oil tank shall also be provided with filling connection (threaded) with cap, gauge glass indication & cocks, drain cock, inspection/cleaning cover with gasket and nuts/bolts. M.S. dike to hold 150% of the day tank capacity to be built around the Day Tank.



- 46.17 Contractor to provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gases to outside in open air as per site conditions (contractor to check the site).
- 46.18 Contractor to provide all accessories, fittings, and fixtures necessary and required for a complete operating engine set. The exhaust pipe shall be taken outside the building with minimum number of bends (approx. length 30 Mts.) and shall be duly heat insulated with 50mm thick glass wool covered with 24 gauge aluminum cladding.
- 46.19 Contractor shall submit to the Owner special requirements, if any, for the ventilation of the pump room.

#### **47.00 BASE PLATE**

Pumps and motors shall be mounted on a common structural base plate and installed as per manufacturer instructions.

#### **48.00 AIR VESSEL**

The contractor shall provide one air vessel fabricated from 8mm M.S. plates with 10mm dished ends and suitable supporting legs. Each air vessel shall be provided with a 80mm dia, flanged connection from pump, one 25mm dia, drain with valve, one gun metal water level gauge and 25mm sockets for pressure switches. The vessel shall be 450mm dia x 1800mm high and tested to 20 Kgs./Sq.cm. pressure.

#### **49.00 CUBICLE TYPE SWITCH BOARDS/L.T. PANEL**

- 49.01 Cubicle type switch boards and components shall conform to the requirements of the latest revision including amendments of the following codes and standards.

|                                |   |   |
|--------------------------------|---|---|
| IS:8623                        | : | Specification for factory built assemblies of switch-gear and control gear for voltage up to and including 1000-V AC/1200 V-DC. |
| IS:4237                        | : | General requirements for switchgear and control-gear for voltage not exceeding 1000-V.  |
| IS:2147                        | : | Degree of protection provided by enclosures for low voltage switchgear and control-gear.  |
| IS:1018                        | : | Switchgear and control-gear selection/installation and maintenance.   |
| IS:6005                        | : | Code of practice for phosphating of iron and steel.   |
| IS:13947-1993/<br>IE:C947-1989 | : | Air circuit breaker/Moulded case circuit breaker.   |
| IS:1248                        | : | Direct acting indicating analogue electrical measuring instruments and testing accessories.                                     |
| IS:2705                        | : | Current transformers for metering & protection with   |

The board shall be metal enclosed single front, indoors, floor mounted free standing type or wall mounting type as mentioned in BOQ. The panel shall be designed for a degree of protection of IP-52. The panel height shall not exceed 2350 mm including horizontal main bus bar at top. Keeping in view the operating height of the top switch 1750mm from finish floor. 400-mm clear space shall be left through out the panel at bottom. The cold rolled sheet steel will be of 2mm thick.

All cutouts and covers shall be provided with synthetic rubber gaskets. (Preferably neoprene).

The panel shall be divided into distinct vertical sections each comprising of:

- i) Complete enclosed bus bar compartment for running horizontal and vertical bus bars.
- ii) Complete enclosed switchgear compartment one for each circuit for housing air circuit breaker, MCCB etc.
- iii) Compartmentally for power and control cables of at least 300mm width covering entire height provided.

All cable alley must be provided with threaded nipples for CO2 flooding system and shall be connected to all compartment with centralized CO2 system

- vi) The panel shall have 20% spare space duly wired for future use.

The front of each compartment shall be provided with hinged single lead door with locking facilities. Panel shall be provided with suitable lifting facilities. Isolators & MCCB/ACBs shall be of fixed/drawout type as described later.

Each feeder shall have compartmentalized construction cable entry shall be from top/bottom (3mm thick gland plate shall be provided) as required.

The panel shall be provided with three phase buses and neutral bus bars of aluminum sections throughout the length of the panel and shall be adequately supported and braced to withstand the stresses due to the short circuit current of 50 KA rms. For 1 sec. Maximum temperature rise of bus bars and bus bar connection while carrying rated current shall not exceed 40 amp. over an ambient temperature of 50 deg.C.

The minimum clearance in air between phases and between phases and earth for the entire run of the bus bar connections shall be 25mm minimum bus bars support insulators shall be made of non-hydroscopic non-combustible track resistant and high strength type porcelain or polyester fiber glass moulded material.

All bus bars shall be colour coded as per IS: 375 and the current density shall be 1 amp/sq.mm.

G.I. earth bus of 50x6mm size shall be provided at the bottom of the panel through out the length. Similarly 40x6mm G.I. strip in each vertical section for earthing the

individual equipment/accessories shall be provided and connected to main horizontal bus.

Contractors shall be electro-magnetic types with interrupted duty as per IS: 2959. The main contacts shall be of Silver or silver alloy, provided with minimum 2 NO and 2 NC auxiliary contacts. The push button should be of shrouded type and each should be provided with 1 NO and 1 NC contact. Colour coding shall be as per IS: 6875 (Part II).

#### **50.00 ACB**

The circuit breaker shall be of air break type in order to eliminate fire and explosion risk and shall comply with the IS: 13947-1993 with a rupturing capacity of not less than 50 MVA at 415 volts or as specified elsewhere (The service short circuit breaking capacity shall be as specified and equal to the short circuit with stand value). The breaker shall be provided with microprocessor based releases for over load and short circuit protection.

The breaker shall consist of a horizontal drawout pattern triple pole, fully interlocked, independent manual spring operated mechanism. The mechanism should be such that the circuit breaker is at all times free to open immediately. The trip coil is energized. Current carrying parts should be silver plated and suitable arcing contacts shall be provided to protect the main contact arc-chutes for each pole shall be provided and shall be lifted out for the inspection of main and arcing contact.

Self-aligning cluster type isolating contacts shall be provided on breaker for interlocking protection metering and for any other purposes.

Breaker shall be provided with automatic safety shutters to screen the main live contact when the breaker is withdrawn. The frame of the circuit breaker should be positively earthen when the breaker is racked into the cubicle.

The following safety arrangements shall be provided for the safety of the personnel to preventnal-operation.

- i) Interlock to prevent the truck from being withdrawn or replaced except in the fully isolated position.
- ii) Interlock to prevent earth connection from being made by the earthing device except breaker is open.
- iii) Interlock to prevent the breaker from being made alive without its rack in position.

#### **51.00 Moulded Case Circuit Breaker (MCCB)**

MCCB shall conform to the latest IS: 13947-1993/IEC 947-1989. The Service Short Circuit Breaking Capacity (ICS at 415 VAC) should be 50 KA.

MCCB shall be Current Limiting and comprise of Quick Make - Break switching mechanism preferably Double Break Contact system are extinguishing device and the tripping unit contained in a compact, high strength, heat resistant, flame

retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses. All MCCBs shall be capable of defined variable overload adjustment. All MCCBs rated 200 Amps and above shall have adjustable magnetic short circuit pick up.

The trip command shall over ride all other commands. MCCB shall employ maintenance free double break contact system to minimize the let thru' energies and capable of achieving discrimination upto the full short circuit capacity of downstream MCCB. The manufacturer shall provide both the discrimination tables and let thru' energy curves. The MCCB shall not be restricted to Line/Load connections.

The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to disconnection as per the IS/TEC indicating the true position of all the contacts. In case of 4 poles MCCB the neutral shall be defined and capable of offering protection.

The general-purpose control switch shall be provided for ON/OFF Auto/Manual. The switch shall be provided with engraving plates on the front with the complete inscription.

The switch shall be normally a fixed control box type heavy-duty unit.

Indicating lamps shall be of the panel mounting, LED type and shall have execution plates marked with its function wherever necessary. The colour of the lamp cover shall be red for 'ON' and green for 'OFF'.

#### **52.00 Motors and Starters for Fire Pumps**

The starters shall be of DOL type. The motors should have double sq. cage or other provision to limit the starting current to 4 times the full load current.

#### **53.00 Name Plates & Lables**

- i) Panel and all modules shall be provided with prominent engraved identification plates. The module identification designation. For single front switchboards, similar panel and board identification lables shall be provided at the rear also.
- ii) All nameplates shall be of non-rusting metal or 3-ply lamicold, with white engraved lettering on black background. Inscription and lettering sizes shall be subject to Owner's approval.
- iii) Suitable stencilled paint marks shall be provided inside the panel/module identification of all equipment in addition to the plastic sticker lables, if provided. These labels shall be partitioned so as to be clearly visible and shall have the device number, as mentioned in the module wiring design.

#### **54.00 Painting of all Steel Work**

The steel used for fabrication of electrical/panels/equipment should be stove enameled as per the detailed specifications given below:

- a) Degreasing: All the steel components, to be painted, should be effectively cleaned by alkaline degreasing.

- b) Pickling: Oxide scale rust formation are to be removed in a hot bath of sulphuric acid. Pitting of the surface is to be prevented by the use of pickling inhibitors.
- c) Cold Rinsing: The parts are then to be washed with cold water to remove all traces of acidic solution.
- d) Phosphating: In order to attain durable paint coating the metal surface is to be given phosphating treatment by development a phosphate layer on the surface. Preferably hot chromic solution is to be used in the phosphating plant.
- e) Passivating: This process is to be carried out by using deoxidizing solution.
- f) Drying: The treated parts should then be dried in a hot chamber in dust free atmosphere to ensure that they are absolutely clear and dry before the paint is applied.
- g) Primer Coating: The treated and dried parts are to be sprayed with high corrosion resistance primer.
- h) Stove Drying: The primer coating is to be baked in an electrically heated, air circulated area type drying oven.
- i) Finishing Coat: The finishing paint coat is to be applied by spraying two coats of 15 micron thickness powder coated paint of approved shade.

#### **55.00 Wiring**

Control and protective wiring shall be done with copper conductor PVC insulated 1100 volts grade multi-stranded flexible wire of 2.5 sq.mm 2 cross section. The colour coding shall be as per latest edition of IS: 374.

Each wire shall be identified by plastic ferrule. All wire termination shall be made with type connection. Wire shall not be taped or spliced between terminal points.

Terminal blocks shall preferably be grouped according to circuit function and each terminal block group shall have at least 20% spare capacity.

Not more than 1 (one) wire shall be connected to any terminal block.

#### **56.00 Current Transformer**

Current transformers shall be of ratio, burden (shall be worked out by panel supplier), class/accuracy specified in Single Line Diagram.

Current transformers shall conform to latest edition to relevant standards. Current transformers shall be epoxy resins cast with bar Primary or ring type.

The design and construction shall be sufficiently robust to withstand thermal and dynamic stresses due to the maximum short circuit current of the circuit.

The current transformer shall preferably be capable of being left open circuited on the secondary side with primary carrying rated full load current, without overheating or damage. Short time current rating and rated withstands time shall be same as corresponding C.B.

CT core laminations shall be of high-grade silicon steel.

Secondary terminals of CT shall be brought out to a terminal block, which will be easily accessible for testing and external connections. Facility shall be provided for short-circuiting and earthing of CT secondary leads through a removable and accessible link with provision for attaching test link.

Rating plate details and terminal markings shall be according to the latest edition of relevant Indian Standard specification.

Generally separate current transformers (core) shall be used for metering and protection.

## **57.00 CABLES**

- a) Contractor shall provide all power and control cables from the motor control center to various motors and control devices, of ratings as per IS: 3961.
- b) All power and wiring cables shall be FRLS with (inner and outer sheath) aluminium conductor PVC insulated armoured and PVC sheathed of 1.1 KV grade. Control cables and power cables of 2.5 sq.mm or less shall be of copper, FRLS, armoured. Cables and wires shall comply with requirements of IS: 5831, 694, 8130, 7098 (I) & 1554 as the case may be.
- c) All cables shall have stranded conductors. The cables shall be supplied in drums as far as possible and bear the manufacturer's identification mark.
- d) All cable joints shall be made in an approved manner as per accepted practice.

## **58.00 CABLE TRAYS**

58.01 Cable trays shall be 2mm thick GI/CRCA powder coated as per approved shade of client. Sheet steel, ladder type/perforated cable trays including fixing along wall/ceiling complete with M.S. rod/flat hangers directly grouted in walls/ceiling etc as required.

58.02 The sizes shall be as follows and as directed by the Owner.

### **A. PERFORATED CABLE TRAY**

- a) 150 mm wide 75 mm deep
- b) 300 mm wide 75 mm deep

### **B. LADDER TYPE CABLE TRAY**

- a) 150 mm wide
- b) 300 mm wide

## **59.00 EARTHING**

59.01 Fire Fighting Contractors shall have to provide earthing strips (G.I. 25x3mm) or earthing wires (G.I. 8 SWG) as may be required for proper earthing of the equipments supplied by him. Thickness of galvanization to be 75 microns (minimum). Each electrical equipment is to be earthen at 2 points.

## **1103 SPECIFICATIONS FOR FIRE HYDRANT SYSTEM**

### **60.00 SCOPE OF WORK**

60.01 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install wet riser fire hydrant system as required by the drawings and specified hereinafter or given in this schedule of quantities.

60.02 Without restricting to the generality of the foregoing, the fire hydrant system shall include the following: -

Mild steel mains including valves, hydrants and all other accessories.

Mild steel pipe fire risers within the building.

Landing valves, synthetic hose pipes, hose reels, hose cabinets, fire brigade connections, connection to pumps, appliances and pressure reducing devices.

Excavation, anchor blocks and valve chambers.

### **61.00 GENERAL REQUIREMENTS**

61.01 All materials shall be of the best quality conforming to the specifications and subject to the approval of the employer. The wet riser system shall remain pressurized at all times during operation, and as such the piping work shall be carried out to withstand the same.

61.02 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

61.03 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc.

61.04 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.

61.05 Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

### **62.00 PIPES AND FITTINGS**

#### **FOR INTERNAL WORK:**

a. All pipes within the building in exposed locations and shafts including connections buried under floor shall be GI/ERW mild steel tubes conforming to IS: 1239 (Heavy

class) up to 150mm AB and IS 3589 above 150 NB's with screwed or welded joints as specified by the engineer in charge at least 10% of welded joints shall be radiographically tested.

- b. Fittings of 50mm or below shall be forged steel with socket weld ends of approved makes. For 65mm and above shall be W.I./M.S. with butt weld ends.

### **63.00 JOINTING**

Gasket, for use in between flanged joints, to be of CAF as per IS-2712, thickness as specified in S.O.Q.

### **64.00 EXCAVATION**

64.01 Excavations for pipeline shall be in open trenches to levels and grades shown on the drawings or as required at site. Pipelines shall be buried to a minimum depth of 1 to 1.5 meter or as shown on the drawings.

64.02 Wherever required contractor shall support all trenches or adjoining structures with adequate supports to prevent land slides.

64.03 On completion of testing and painting, trenches shall be refilled with excavated earth in 15-cm layers and compacted.

64.04 Contractor shall dispose off all surplus earth within the site.

### **65.00 ANCHOR BLOCKS**

65.01 Contractor shall provide suitable cement concrete anchor blocks as may be necessary for overcoming pressure thrusts in under ground/external pipes. Anchor blocks shall be of cement concrete 1:2:4 mix.

### **66.00 VALVES**

66.01 Butterfly valves above 65mm shall be of cast iron body and bronze/gunmetal seat. They shall conform to type PN 1.0 of IS: 13095.

66.02 Non return valves shall be of cast iron body and bronze / gunmetal seat. They shall be swing conform to Class 1 of IS: 5312 and have flanged ends. They shall be swing check type in horizontal runs and lift check type in vertical runs of piping. They shall not be spring loaded type.

66.03 Check valves shall be cast iron double flanged conforming to IS 5312-1975 with cast iron steel body and stainless steel internal trims.

Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20kg/sqcm pressure. Valves shall conform to IS:778.

### **67.00 FIRE HYDRANTS**

#### **67.01 EXTERNAL HYDRANTS**



Contractor shall provide external hydrants. The hydrants shall be controlled by a cast iron sluice valve. Hydrants shall have instantaneous type 63-mm dia outlets. The hydrants shall be of gunmetal and flange inlet and single outlet conforming to I.S.5290-1983 with G.I. duck foot bend and flanged riser of required height to bring the hydrant to correct level above ground.

- 67.02 Contractor shall provide for each external fire hydrant two nos. of 63 mm dia 15 meter long synthetic fibre non perculating hose pipe with gunmetal male and female instantaneous type couplings machine wound with copper wire hose to I.S. 636 type B and couplings to IS 903 with IS certification), gunmetal branch pipe with 16 mm nozzle to I.S. 903-1984.

#### **68.00 INTERNAL HYDRANTS**

- 68.01 Contractor shall provide on each landing and other locations as shown on the drawings one single headed gunmetal landing valve with 63 mm dia outlets and 80 mm inlet (I.S. 5290-1969) with individual shut off valves and cast iron wheels. Landing valves shall have flanged inlet and instantaneous type outlet as shown on the drawings.

- 68.02 Instantaneous outlets for fire hydrants shall be of standard pattern approved and suitable for fire brigade hoses. Contractor shall provide for each internal fire hydrant station four numbers of 63 mm dia 7.5 meter long synthetic non perculating hose pipes with gunmetal male and female instantaneous type coupling machine wound with G.I. wire (Hose to I.S. 636 type B and couplings to I.S. 903 with I.S. certification), fire hose reel, gunmetal branch pipe with nozzle I.S. 903 fireman's axe.

- 68.03 Each hose box shall be, after thorough cleaning of surface, painted as per Section 28 of General Technical Specifications. The words FIRE HOSE to be painted on the inner face of the glass.

#### **69.00 FIRST AID HOSE REELS**

- 69.01 Contractor shall provide standard fire hose reels with 20 mm dia high pressure rubber hose of 36 meters length with gunmetal nozzle with 5mm bore, and control valve, shut of nozzle connected wall mounted on circular hose reel of heavy duty mild steel construction and cast iron brackets. Hose reel shall conform to IS: 884-1969. The hose reel shall be connected directly to the M.S pipe riser through an independent connection.

#### **70.00 PRESSURE GAUGES**

- 70.01 All pressure gauges shall be of dial type with bourdon tube element of SS 316. The gauge shall be of reputed make. The dial size shall be 150-mm dia and scale division shall be in metric units marked clearly in black on a white dial. The range of pressure gauge shall be 0 to 12 kg/sq.cm.

- 70.02 All pressure gauges shall be complete with isolation cock, nipples, tail pipes etc.

#### **71.00 PRESSURE SWITCHES**

- 71.01 The pressure switch shall be industrial type single pole double throw electric pressure switch designed for starting or stopping of equipment when the pressure in

the system drops or exceeds the pre-set limits. It shall comprise of a single pole changeover switch, below element assembly and differential sprindle.

71.02 All the pressure switches shall have 1/4" B.S.P (f) inlet connection and screwed cable entry for fixing cable gland.

71.03 The electric rating of the switch shall be as under:

| Type of supply | Voltage | Non -Inductive | Inductive |
|----------------|---------|----------------|-----------|
| A.C.           | 110-380 | 10 Amp         | 6 Amp     |
| D.C.           | 24-250  | 12 Watts       | 12 Watts  |

## **72.00 FIRE BRIGADE CONNECTION**

72.01 The contractor shall provide as shown on drawing gunmetal four ways collecting head with 63mm dia instantaneous type inlets with built in check valve and 100/150 mm dia. Outlet connection to the fire main grid and for tank filling, collecting head shall conform to IS: 904-1964.

## **73.00 AIR VALVES**

73.01 The contractor shall provide 25 mm dia screwed inlet cast iron single acting air valve on all high points in the system or as shown on drawings.

## **74.00 DRAIN VALVE**

80/50mm dia GI / black steel pipe conforming to IS:1239 heavy class with 50mm gunmetal full way valve for draining and water in the system in low pockets.

Pressure gauge of suitable range shall be installed on the discharge side of each pump vacuum gauge shall be provided on suction side for pumps with negative suction. The dial size shall be 250mm. The gauges shall have brass cocks.

Orifice plates shall be of 6mm thick stainless steel to reduce pressure on individual hydrants to operating pressure of 3.5kg/sq.cm. Design of the same shall be given by the Contractor as per location and pressure condition of each hydrant.

## **75.00 VALVE CHAMBERS**

75.01 Contractor shall provide suitable brick masonry chambers in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundations 150 mm thick 1:5:10 mix (1 cement: 5 fine sand 10 graded stone aggregate 40 mm nominal size) 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling, complete.

75.02 Valve chamber shall be of the following size:

For depths 130 cm and beyond 120x120 cms  
Weight of C.I. frame and cover shall be 38 kg.

## **76.00 PIPE PROTECTION**

See Clause 15.0 & 16.0 on 'Painting' and 'Coating/wrapping' under General Technical Specifications).

## **77.00 PIPE SUPPORTS**

- 77.01 All pipes shall be adequately supported from ceiling or walls by means of anchor fasteners by drilling holes with electrical drill in an approved manner as recommended by manufacturer of the fasteners.
- 77.02 All supports/clamps fabricated from M.S. structural e.g. rods, channels, angles and flats shall be painted as described in specifications for "Painting" under General Technical Specifications.
- 77.03 Where inserts are not provided the contractor shall provide anchor fasteners. Anchor fasteners shall be fixed to walls and ceilings by drilling holes with electrical drill in an approved manner as recommended by the manufacturer of the fasteners.

| Pipe Support Spacing | Horizontal | Vertical |
|----------------------|------------|----------|
| Pipe upto 50 mm      | 2 Mtr      | 3 Mtr    |
| Pipe 65 - 100 mm     | 1.75 Mtr   | 3 Mtr    |
| Pipe above 100mm     | 1.50 Mtr   | 3 Mtr    |

## **78.00 AIR VESSEL AND AIR RELEASE VALVE**

Air vessel on top of each wet riser piping shall be installed before execution for approval fabricated out of at least 8mm thick steel to withstand the pressure, with dished ends and supporting legs. This shall be of 300 mm dia and 1m high. This shall be completed with necessary flange connection to the wet riser piping and air release valve with necessary piping to meet the functional requirement of the system. The air vessel shall be of continuous welded construction and galvanized to IS: 4736-1968. This shall be tested for twice the working pressure.

## **79.00 TESTING**

- 79.01 All piping in the system shall be tested to a hydrostatic pressure of 11.0 kg/sq.cm without drop in pressure for at least 2 hours.

Rectify all leakages, make adjustments and reset as required and directed.

## **80.00 HOSE CABINETS**

- 80.01 Provide doors/hose cabinets for internal/external hydrants respectively fabricated from 16 gauge M.S. sheet with double glass front door and locking arrangement, with breakable glass key access arrangement, duly painted red as per specifications given on page 12 para 28.8 fixed to wall/floor as per site conditions. The cabinet shall have a separate chamber to store a key with breakable glass as per approved design. Hose cabinets shall be hinged double door partially glazed with locking arrangement, painted as per Section 28 of General Technical Specifications with 'FIRE HOSE' written on it prominently. Samples of hose cabinet for indoor and outdoor works shall be got approved from HSCC before production/delivery at site.

80.02 For external hydrants the hose cabinets shall be fabricated from 16 gauge thick M.S. sheet with double shutter glass front door and locking arrangement with breakable glass key access arrangement. The cabinet shall have 'FIRE HOSE" written on it prominently. Sample of hose cabinet shall be got approved from the HSCC before installation at the site.

#### **81.00 MEASUREMENT**

81.01 Mild steel pipes shall be measured per linear meter of the finished length along the center line and shall include all fittings (including flanges), welding, jointing, clamps for fixing to walls or hangers, anchor fasteners and testing.

81.02 Butterfly valves, check valves and full way valves shall be measured by numbers and shall include all items necessary and required for fixing and as given in the specifications/schedule of quantities.

81.03 Landing valves hose cabinets, synthetic non-perculating fire hose pipes, First-aid fire hose reels (with gunmetal full way valves) and gunmetal branch pipes shall be measured by numbers and shall include all items necessary and required for fixing as given in the specifications/schedule of quantities.

81.04 Suction and delivery headers shall be measured per linear meter or finished length and shall include all items as given in the schedule of quantities.

81.05 Painting/wrapping/coating of headers, pipes shall be included in the rate for pipes and no separate payment shall be made.

81.06 Brick masonry chambers shall be measured by number and shall include all items as given in the schedule of quantities/specifications.

81.07 No additional payment shall be admissible for cutting holes or chases in walls or floors, making connections to pumps, equipment and appliances.

#### **1104 SPECIFICATIONS FOR SPRINKLER SYSTEM**

##### **82.00 SCOPE OF WORK**

82.01 Work under this section shall consist or furnishing all labour, materials, equipment and appliances necessary and required to completely install the sprinkler system as required by the drawings and specified herein after or given in the schedule of quantities.

a) Sprinkler mains, branch and external piping complete with valves, alarm, hangers and appurtenances and painting.

b) Sprinkler heads with spare sprinklers

c) Connections to risers, pumps and appliances

##### **82.02 GENERAL REQUIREMENTS**

82.01 All materials shall be of the best quality conforming to specifications and subject to the approval of the engineer.

- 82.02 Pipes and fittings shall be fixed truly vertical horizontal or in slopes as required in neat workman like manner.
- 82.03 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc.
- 82.04 Pipes shall be supported from walls and ceiling by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.
- 82.05 Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.
- 82.06 Sprinkler heads shall be approved by the underwriters Laboratories (U.L.) or Fire officers Committee (FOC). The finish shall be as specified in the schedule of quantities. The contractor shall give required tools for removing and fixing of different types of sprinklers free of cost as directed by the HSCC.

### **83.00 SPRINKLER HEADS**

- a) Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be of approved make and type.

- b) Types:

- i) Conventional Pattern:

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling. The sprinklers shall be suitable for erection in upright position or pendant position.

- ii) Spray Pattern:

The spray type sprinkler shall produce a hemispherical discharge below the plane of the deflector.

- iii) Ceiling (flush) Pattern:

These shall be designed for use with concealed pipe work. These shall be installed pendant with plate or base flush to the ceiling with below the ceiling.

- c) Constructions:

- i) Bulb: - Bulb shall be made of corrosion free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.
- ii) Valve Assembly:-Water passage of the sprinkler shall be closed by a valve assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.

iii) Yoke: - The yoke shall be made of high quality gun metal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti-corrosive treatment if the same is to be used in corrosive conditions.

iv) Deflector:-The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

d) Colour Code:

The following colour code shall be adopted for classification of sprinkler according to nominal temperature ratings:

e) Size of Sprinklers Orifices:

The following sizes of sprinklers shall be selected for various classes or hazards.

|                       |                       |
|-----------------------|-----------------------|
| Extra light hazard    | 10/15 mm nominal bore |
| Ordinary light hazard | 15 mm nominal bore    |
| Extra high hazard     | 15/20 mm nominal bore |

f) Stock of replacement sprinkler:

The following spare sprinklers shall be supplied along with the system:

|                           |               |
|---------------------------|---------------|
| Extra high hazard systems | 6 sprinklers  |
| Ordinary hazard systems   | 24 sprinklers |
| Extra high hazard systems | 36 sprinklers |

g) Temperature Rating:

For normal conditions in temperature climates rating of 68/74 deg. C shall be used. However the temperature rating shall be as close as possible to, but not less than 30 deg. C above the highest anticipated temperature conditions.

**84.00 Installation Control Valve:-** Installation control valves shall comprise of the following:

a. One man stop valve of full way pattern with gunmetal pointer to indicate where open/shut.

b. One automatic alarm valve, fitted with handle and cover.

c. One hydraulic alarm motor and gong for sounding a continuous alarm upon outbreak of fire.

d. One combined waste and testing valve including 5mtr of tubing and fittings.

e. Alarm stop valve

f. Strainer

- g. Drain plug
- h. Padlock & strap
- i. Wall box for installation of valve

**85.00 Pressure Gauges:-**Burden type pressure gauges conforming to IS/BS specifications shall provide at the following locations.

- a. Just above alarm valve.
- b. Just below alarm valve, on the installation stop valve.
- c. One pressure gauge on delivery side of each pump.
- d. Required number of pressure gauges on pressure tank.

**86.00 INSTALLATION OF PIPING**

**86.01 Below ground piping: -** Under ground piping shall be installed in masonry trenches with cover or reinforced concrete. The pipe work shall be supported at regular intervals of 2.5m with masonry or RCC supports. Wherever pipes pass through roads/pavements suitable size hue pipes shall be provided for protection of piping. Underground pipes shall be protected against corrosion with two coats of bituminous painting and wrapped with tarfelt or similar covering. If the piping is to be buried in ground with back filling of earth, a coat of epoxy painting shall be given.

**86.02 Above ground piping:-**

a. All above ground piping shall be installed on suitable to pipe hangers/supports as required. The hangers shall be made of MS angles, channels etc. and painted to the required finish (with suitable synthetic enamel Paint). The spacing of piping supports shall be as follows:

|      |                   |          |
|------|-------------------|----------|
| i)   | 20mm to 32mm dia  | 2 mtr    |
| ii)  | 40mm to 65mm dia  | 2 mtr    |
| iii) | 65mm to 100mm dia | 1.75 mtr |
| iv)  | above 150mm dia   | 1.50 mtr |

b. Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve. In case of basement and other areas where the pipe work, is below the installation drain valve/auxiliary valves of the following sizes shall be provided.

- i) 20mm dia valve for pipes upto 50mm dia
- ii) 25mm dia valve for 65mm dia pipes
- iii) 32mm dia valves for pipes larger than 65mm dia

c. Piping shall be screwed type upto 50mm dia. Welding of joints will be allowed for pipes of 50mm of larger diameters.

- d. The piping shall be pressure tested by the hydrostatic method upto a pressure of 1.5 times the working pressure the piping shall be slowly charged with water so that all the air is expelled from the piping by providing a 25mm inlet with a stop cock. The piping shall be allowed to stand full of water for a period of 2 hours and then the piping shall be put under pressure by means of manually operated test pump or by a power driven test pump. The pressure gauges used for testing shall be accurate and shall preferably be calibrated before the testing is carried out. All the leakages and defects in joints revealed during the testing shall be rectified to the entire satisfaction of the Consultant. The system may be tested in sections parts as the work of erection of piping proceeds. The piping shall withstand 1.5 times the working pressure for at least 2 hours.

## **87.00 FLOW SWITCH**

- 87.01 Provide one electrically operated flow switch of appropriate dia, at the head of each circuit. Flow switches should be capable of the required flow in the circuit. The electrical cabling for the flow switches and control panel shall be provided by the contractor.

## **88.00 PUMP SETS**

Same as wet riser & Hydrant system specification.

## **89.00 ANNUNCIATION SPRINKLER PANEL**

The equipment for control panel should be compact neatly wired and enclosed in a suitable 14 gauge M.S. sheet/16 CRCA sheet Metal Box which is suitably treated against corrosion. The control panel should be painted with over banked enamel paint. The panel shall consist of:

- a) Panel should be made in a modules of 10 zones e.g. Each module will have audible and visual indications and will monitor the circuit conditions.

A.C. Power Supply

Fault and Fire indication lamp.

Alarm acknowledgment push buttons.

- b) The circuits provided in the control panel for each zone shall indicate the following conditions:

i) Open Circuit in zone wiring

ii) Short Circuit in zone wiring

iii) Normal conditions

iv) Power failure

v) Low battery

- c) The Automatic annunciation panel shall suitable for operation on 24V DC and shall be provided with power supply unit suitable to operate on A.C. mains of 230V with a variation of 10%. The system shall be so designed that in case of failure of A.C. main supply it shall automatically change over to battery supply.



- d) Suitable protection may be provided against charging of the battery over and above the specified values.

## **90.00 BATTERY UNIT**

- i) The system shall be powered by lead acid storage stationery complete with automatic dual rate charger boost and trick operating from 220V, 50 Hz, single phase, mains supply. The battery capacity should be adequate for operation of the system connected to it for at least 24 hours in the non-alarm state followed by 30 minutes operation of all sounders and other connected equipments after a power (mains) failure.
- ii) The automatic charger should operate at the boost charge when the battery terminal voltage is less than about 2.1V 20 per cell, and operate at a trickle charge rate of 100 to 200 HA, when the battery terminal voltage exceeds about 2.25 per cell.
- iii) The power unit should have the following:
  - a) Voltmeter 0-30 V
  - b) Ammeter of suitable range
  - c) Indicator lights for mains
  - d) Indicator lights for DC output
- iv) The preferred nominal DC voltage shall be 24 V and shall preferably be isolated. (IF an isolated supply is provided a line earthing indicator should also be provided).
- v) The DC system and the detection and sounder circuits shall be protected against their attaining a voltage to earth exceeding 50V.
- vi) The connection to the 220V, 50Hz, single phase system shall be through a three pin plug socket especially provided for the connection to the annunciation panel. This connection should in addition utilized for earthing all non-current carrying metal parts of the sprinkler system, except those that are either doubly insulated or mounted at a height exceeding 2.2 meters.
- vii) The battery unit shall be housed in a steel cabinet with suitable mounting at least 2.5mm thick suitably painted with two coats of Post Office Red, Enamel necessary vent holes should be provided for proper ventilation.
- viii) One battery unit complete with battery charger shall be provided for each control panel.

## **91.00 TESTING**

- 91.1 All pipes in the system shall be tested to a hydrostatic pressure of 11.0 kg/sq.cm without drop in pressure for at least 2 hours. Rectify all leak ages, make adjustments and retest as required.

## **92.00 MEASUREMENT**

- 92.01 Black steel pipes shall be measured per linear meter of the finished length and shall include all fittings including flanges, welding, jointing clamps for fixing to walls or hangers and testing.
- 92.02 Butterfly valves, check valves and full way valve and flow indicating switches shall be measured by numbers and shall include all items necessary and required for fixing as given in specifications.
- 92.03 Cabinet and the spare sprinkler heads, with spanner etc. shall be measured as per actual item given in the schedule of quantities.
- 92.04 Sprinkler heads shall be measured by numbers.
- 92.05 No additional payment shall be admissible for cutting holes, or chases in the wall or floors, making connections to pumps, equipment and appliances.
- 92.06 Painting and coating/wrapping of pipes shall be included in the rates for pipes and no extra payment shall be made.

## **1105 COMMISSIONING OF FIRE FIGHTING SYSTEM**

### **93.00 SCOPE OF WORK**

- 93.01 Work under this section shall consist of pre commissioning, commissioning testing and providing guarantees for all equipment, appliances and accessories supplied and installed by the contractor under this contract.

### **94.00 GENERAL REQUIREMENTS**

- 94.10 Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.
- 94.20 Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.
- 94.30 All inspection and testing for gauging the efficacy of all equipment would be as per the TAC regulations.

A survey of the site of the work shall be made by the Contractor before preparation of the detailed drawings for submission to the department for approval. The installation shall be carried out strictly in accordance with the approved drawing.

- 94.40 The scope of installation work shall include the following, where or not expressly mentioned in the schedule of work.
- i. Cement concrete (1:2:4mix) foundation for all pump sets.
  - ii. Vibration isolation arrangement for all pump sets.
  - iii. Filling up the hole in flooring with cement concrete, after laying the wet riser pipes.

- iv. Necessary supports and clamps for wet riser pump room.
- v. Necessary supports and clamps for wet riser plumbing the building.
- vi. Supporting bracket/frame work for the fuel oil tank of the engine.
- vii. Excavation of the earth, consolidation and refilling after laying of wet riser piping in ground.
- viii. Provision of necessary brick base or intermediate support as required in approved manner in case of soils which are not strong enough to support the pipes, thereby likely to cause different settlement.
- ix. Necessary anchor block of ample dimensions in 1:2:4 cement concrete at all bends, tee connections, foot of the wet riser, and other places as required to stand the pressure thrust in pipes.
- x. Necessary masonry work/steel work for supporting hose cabinets near external (yard) hydrants.
- xi. Valve chambers of approved design with external (yard) hydrant.
- xii. Ground level hydrants of approved design, where specified.
- xiii. Cutting and making good the damages for the installation work of the riser system
- xiv. Strainers and foot valves for pumps with negative suction and strainers for pumps with positive suction.
- xv. All the required control piping, exhaust piping (5m long) from engine, oil piping for fuel oil and lubricating oil for the engine, drain piping from the pumps to the drain pit in the pump room, overflow piping from priming tank to the sump. The piping work shall include all necessary fittings, valve and accessories for effective functional requirements.
- xvi. Inter-connecting cable work with controls, control panel, batteries etc. including battery leads.
- xvii. Orifice plates at individual hydrants, as required.

Where provision of GI/MS pipe shall below ground become inescapable, it shall be protected from soil corrosion by 2 coats of coal tar hot enamel paint and 2 wraps of reinforced fiber glass tissue or bituminized horizon.

Each CI pipe/GI pipe shall be subjected to hydraulic pressure test before installation, in presence of the Engineer or his authorized representative.

External (yard) hydrants shall be located at least 2m away from the face of the buildings but not more than 15m and be accessible.

Where external hydrants below ground level are specifically indicated in tender specifications, there shall be enclosed in masonry or cast iron structure of size 75cm<sup>2</sup>

and 8cm above ground level. The hydrant shall be within 8cm from the top of the enclosure.

Necessary facility for draining the rise pipe shall be provided at ground floor level with 40mm size sluice valve.

Internal hydrants at each floor shall be located at about 1m above floor level.

Valve chambers shall be of 1sqm meter in size, with cover.

All hoses shall be numbered and a record submitted with completion plane. The number and length shall be easily recognizable on each hose pipe.

External hose boxes shall be installed such that the hose is not exposed to sun rays.

#### **94.50 PRECOMMISSIONING**

On completion of the installation of all pumps, piping, valves, pipe connections, electrical wiring motor control panels and water level controlling devices the contractor shall proceed as follows:

#### **94.60 TESTING OF M.C.C**

Tests to be carried out for motor control centers shall be :

- 94.60.1 Insulation resistance test with 500 volt merger, before and after high voltage test, on all power and control wiring.
- 94.60.2 High voltage test at 2000 volts A.C. for one minute on all power and control wiring.
- 94.60.3 Low voltage continuity test (6 volts) on power wiring of each feeder, between bus bars and outgoing terminals with switches and contractors in closed position.
- 94.60.4 Low voltage continuity test (6 volts) on all control wiring.
- 94.60.5 Operation test for all feeders with only control supply made "ON" to ensure correctness of control wiring, operation of the various equipment used, such as push buttons, protective devices, indicating lamps and relays, etc. All contractors shall be checked for the presence of humming and chattering.
- 94.60.6 Earth continuity test with voltage not exceeding 6 volts between various non-current metallic of equipment, steel work, etc. and the earth bus provided in the M.C.C.
- 94.60.7 Operation of all instruments and meters provided on the M.C.C.

#### **95.00 FIRE PROTECTION SYSTEM**

- 95.01 Check all hydrant valves and close if any valve is open. Check that all suction and delivery connections are properly made.
- 95.02 Test run and check rotations of each motor and correct the same if required.

## **96.00 PIPE WORK**

- 96.01 Check all clamps, supports and hangers provided for the pipes.
- 96.02 Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specifications if any leakage is found. Rectify the same and reset the pipes.

## **97.00 COMMISSIONING AND TESTING**

### **97.10 FIRE HYDRANT SYSTEM**

- 97.10.1 Pressurize the fire hydrant system by running the main fire pump and after attaining the required pressure shutoff the pump.
- 97.10.2 Open by-pass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts-out at the pre-set pressure. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- 97.10.3 Open by-pass valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the preset pressure and should not cut-out automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However, the jockey pump should cut out as soon as the main pump starts.
- 97.10.4 Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- 97.10.5 When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant simultaneously and allow the hose pipe to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.
- 97.10.6 Diesel engine driven pump should also be checked in the same manner as given in para above by running for 8 hours.
- 97.10.7 After laying and jointing, the entire piping shall be tested to hydrostatic test pressure. The pipes shall be slowly charged with water so that the air is expelled from the pipes. The pipes shall be allowed to stand full of water for a period of not less than 24 hours and then tested under pressure. The test pressure shall be 10kg/cm<sup>2</sup>. The test pressure shall be applied by means of manually operated test pump or by a power driven test pump to be provided by the Contractor. In either case precautions shall be taken to ensure that the required test pressure is not exceeded.
- 97.10.8 The open end of the piping shall be temporarily closed for testing.
- 97.10.9 Test shall be conducted on each pump set after completion of the installation with respect of delivery head, flow and B.H.P. The test shall be carried out by the Contractor at his own cost.

- 97.10.10 All leaks and defects in different joints noticed during the testing and before commissioning shall satisfaction of Engineer.
- 97.10.11 Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting, which is found to be incompatible and does not fit into the other properly, shall be replaced by the contractor. Landing valves shall also be checked by opening and closing under pressure.
- 97.10.12 Testing of fittings/equipments shall be carried out either at site or at works in the presence of a representative of the Engineer. Test certificates shall also be furnished by the Contractor.
- 97.10.13 The automatic operation of the system for the various functional requirements and alarms as laid down in his specification shall be satisfactory carried out on as described above.
- 97.20 HANDING OVER
- 97.20.1 All commissioning and testing shall be done by the contractor to the complete satisfaction of the engineer /consultants, and the job handed over to the client.
- Contractor shall also hand over to the client all maintenance and operation manuals and all items as per the terms of the contract.

## **1106 SPECIFICATIONS FOR ELECTRICAL PANEL PROTECTION SYSTEM**

Electrical Panel Protection System: This includes Supply, Installation, Testing and Commissioning of FK-5-1-12 (Dodecafluoro-2-Methylpentan-3one), Novec-1230 gas Suppression system in accordance with the Contract Documents.

### **98.00 Scope of Work:**

- 98.01 Supply, Installation, Testing and Commissioning of clean Agent (Novec 1230) Fire Suppression system designed to provide a uniform concentration within the electrical panels in accordance with NFPA 2001 and requirements of the contract documents).
- 98.02 Provide all engineering design and materials for a complete agent suppression system including FK-5-1-12 storage cylinders with steel bracket, extinguishing agent, detection tube, cylinder valve and associated accessories including but not limit to; adaptors, pressure switch, tube fittings etc, required for complete operation of system.
- 98.03 All necessary safety requirements such as warning signs, discharge alarm shall be part of system.
- 98.04 The necessary nomenclature such as pressurization level, agent volume, gross/net weight of cylinder shall be clearly marked on cylinder.

- 98.05 Prior to supply of material at site. Contractor must submit following documents for approval of Engineer-in-charge.
- a. Drawing in A-4 size, clearly showing the panel, routing of tube inside the panel, location and fixing arrangement of cylinder & system components.
- 98.06 All doors and holes in the enclosed/equipments should be closed or sealed to maintain the tightness of enclosure.

**99.00 System Description:**

**99.10**

- a) The detection tube shall be fixed with cylinder valve at top of cylinder. The tube shall be pressurized with dry nitrogen. In case of reach of pre-determined temperature (100-120oC), the tube shall rupture gas shall be released from tube over the protected area.
- b) The pressure switch shall be provided for necessary indication of discharge of gas.
- c) The Extinguishing Agent shall be stored in cylinder as liquefied compressed gas, super pressurized with dry nitrogen at 195 psi.
- d) The cylinder shall be equipped with brass valve, pressure gauge (to monitor agent pressure) and isolation valve for maintenance purposes. The cylinder bracket shall be of steel construction with quick release clamp.
- e) The detection tube shall be installed throughout the compartments of panel. The location and spacing of tube shall be above the hazard, to be protected.
- f) In case of fire, the tube shall rupture at a point. The rupture of tube shall result in formation of discharge point and release the agent in uniform pattern.
- g) With system activation, a signal should be generated via Audio Visual Alarm installed at convenient location as per Engineer-in-Charge.

**99.20 System Components:**

The bidder shall provide an under taking from Principle Manufacturer of CE marked product they intent to install, that manufacturer will fully support the bidder for this specific project.

- a) Cylinder of steel construction with standard red epoxy paint finish. Cylinders shall be accompanied by original manufacturers test certificate confirming the contents of the cylinder.
- b) The cylinders shall be from reputed Manufacturers only. Cylinders shall be super pressurized with dry nitrogen to an operating pressure and temperature as per manufacturer recommendations.
- c) Each cylinder shall have pressure gauze and low pressure switch to provide visual and electrical supervision of the cylinder pressure. The low pressure switch shall be wired to the Audio Visual Alarm to provide audible and visual trouble alarm in the event of drop of pressure. The pressure gauze shall be color coded to provide an easy, visual indication of cylinder pressure.

- d) Furnish a welded steel bracket with each cylinder assembly for holding the cylinders in a saddle with a front bracket piece that secures the cylinders.
- e) Cylinder shall be provided with a certificate provided by the company who charge with the FK-5-1-12 gas mixture. The certificate shall be secured around the cylinder with chain fastener.
- f) The Detection Tube, CE marked to be Red Colour and pressurized at 195 Bar. The Detection Tube to rupture between (100-120°C).
- g) The Pressure Switch should be CE Marked having NO/NC contact.

### **99.30 Extinguishing Agent**

#### **FK-5-1-12 (Dedecafluoro-2-Methylpentan-3 One - CF<sub>2</sub>CF<sub>2</sub>C (O) CF (CF<sub>3</sub>)<sub>2</sub>)**

- (a) The agent shall not contain any Hydrofluorocarbons (HFC).
- (b) The ozone depletion potential should be zero.
- (c) The Global warming potential should be equal to or less than 1.
- (d) The Extinguishing Agent should be UL Listed/ FM approved.
- (e) The extinguishing agent should be filled in an UL Listed or FM approved filling station.

### **99.40 Installation**

- a) The system shall be installed on basis of approved drawing.
- b) The installation / final connections shall carry out in direct supervision of representative of Manufacturer/authorized distributors.
- c) Cylinder shall be located so that they are not subjected to mechanical, chemical or other damage.
- d) All system components shall be capable of withstanding heat of fire and severe weather conditions.
- e) Detection Tube to be properly secured inside the panel by Clips/Tie etc.
- f) The Detection Tube outside the panel should be protected in flexible conduit.
- g) Inspection certificate should be pasted on cylinder clearly marking next due date of inspection.

### **99.50 Approved Make: Siemens / Sevo Flex/FireTrex/ Tyco**

## **100.00 HAND APPLIANCES**



## **100.10 SCOPE OF WORK**

- 100.10.1 Work under the section shall consist of furnishing all labour, material, appliances and equipments necessary and required to install fire extinguishing hand appliances.
- 100.10.2 Without restricting to the generality of the foregoing the work shall consist of the following:
- Installation of fully charged and tested fire extinguishing hand appliances CO<sub>2</sub>, Foam, Dry chemical powder type as required by these specifications and drawings.

## **100.20 GENERAL REQUIREMENTS**

- 100.20.1 Fire extinguishers shall conform to the following Indian Standard Specifications and shall be with ISI approved stamp as revised and amended upto date: -
- a) Water gas type I.S. 940
  - b) Dry powder type I.S. 2171-1962
  - c) Mechanical Foam I.S. 10204
  - d) ABC I.S. 13849
- 100.20.2 Fire extinguishers shall be installed as per Indian Standard "Code of practice for selection, installation and maintenance of portable first aid appliances "I.S. 2190-1962".
- 100.20.3 Hand appliances shall be installed in readily accessible locations with the appliance brackets fixed to wall by suitable anchor fasteners.
- 100.20.4 Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.
- 100.20.5 All appliances shall be fixed in a true workman like manner truly vertical and at correct locations.
- 100.20.6 The contractor has to obtain approval of Fire Department for all fire fighting installations.

## **STANDARDS AND CODES**

1. IS 1648 Code of practice for fire safety of building (general ) fire fighting equipment and maintenance.
2. IS 3844 Code of practice for installation of internal fire hydrant in multistorey buildings

3. IS 2217 Recommendations for providing first aid and fire fighting arrangement in public buildings.
4. IS 2190 Code of practice for selection, installation and maintenance of portable first aid fire appliances.
5. Part IV, fire fighting National building code
6. IS 5290 External fire hydrants
7. IS 5290 Internal landing valves
8. IS 904 2 & 3 way suction collecting heads
9. IS 884 First aid hose reel
10. IS 5132 High pressure rubber pipe
11. IS 1537 C.I. Double flanged pipes
12. IS 1538 C.I. Double flanged fittings
13. IS 780 C.I. Sluice valves and Gunmetal valves
14. IS 934 Specifications for portable chemical fire extinguisher soda acid type.
15. IS 2873 Specifications for fire extinguisher of Carbon-di-oxide.

### 11.0 TECHNICAL SPECIFICATIONS OF SOLAR WATER HEATING SYSTEMS

The detailed technical specifications of solar water heating systems, its equipment, components and installation etc. are indicated hereunder:

|    |  |  |
|----|--|--|
| 1. | SYSTEMS CAPACITY   | As specified   |
| 2. | NO of SYSTEMS  | As specified   |
| 2. | SYSTEM TEMP. OUTPUT  | 60°C year average basis on clear sunny days  |
| 3. | SOLAR COLLECTORS<br>Type<br>Make<br>Applicable IS No.<br>Quantity of Solar collectors<br>Absorption area | Selectively coated (Cu-cu type)<br>ISI marked Make BHEL/TATA BP /EMMVEE<br>SOLAR SYTEMS Pvt. Ltd/INTER SOLAR<br>IS:12933<br>As per requirements<br>2.0 /2.3 Sqm(MIN) |
| 4. | COLLECTOR/TANK SUPPORT FRAME   | MS Angle 40X40X5mm minimum adequate for 150 km/hr wind pressure  |

|     |   |  |
|-----|---|--|
| 5.  | HOT WATER STORAGE TANKS (INSULATED)<br>Quantity<br>Capacity<br>Material<br>Insulating material<br>Insulating material Density<br>Insulation thickness<br>Waterproof covering<br>Cladding material   | 1 No. each<br>As per site requirements<br>304 Stainless Steel (min 3 mm)<br>Rockwool/Glass wool<br>48 kg/cu.m<br>100mm (Min.)<br>polythene lining<br>Aluminum 22 swg (0.71 mm thick) |
| 7.  | Distribution PIPINGS (Extra payable as per actual measurements)<br>CPVCI/Composite Pipe<br>Pipe fittings<br>System Internal piping size<br>Insulating material<br>Insulation thickness<br>covering<br>Weatherproof coating /Cladding material | ISI marked<br>ISI marked<br>As per site requirements<br>Imported foam pipe section<br>9mm/10mm thick<br>Fiber Tissue lining<br>Imported resin /aluminium sheet 28 SWG                |
| 8   | PUMPS   | As per requirements JHONSAN/ Kirloskar   |
| 9.  | TEMPERTURE GAUGE<br>Quantity<br>Type<br>Range<br>End connection<br>Make   | 1 No. each for each system<br>Dial gauge<br>0-120C<br>1/2" BSP<br>H Guru   |
| 10. | STRAINER<br>Material<br>Type<br>Mesh  | Cast Iron<br>Y-type Horizontal<br>Brass  |
| 11  | ELECTRICAL BACK-UP  | As PER REQUIRED Heater ISI Marked  |
| 12  | HEAT EXCHANGER<br>Material<br>Type<br>Surface area  | - AS per BOQ<br>Stainless Steel 304<br>Cage type internal /Plate type external<br>As per site requirements   |
| 13  | OPERATION GUARANTEE   | One year   |
| 14  | ALLIED CIVIL & ELECTRICAL WORKS   | Complete for making the system operational/functional in all respects including wiring upto nearby distribution board.   |

Manufacturers or their authorized distributors/specialized firms of solar water heating system of BHEL /TATA BP solar system/ EMMVEE SOLAR SYTEMS Pvt. Ltd/ INTER SOLAR make. Distributors will be required to produce documents in support of their authorization from the manufacturer. The work shall be carried out by trained authored staff of the company.

**Collector specifications:** The collectors shall be of Cu-Cu type with Absorber area of 2.3/2.00 sq. mtrs. The absorber riser-tubes shall be made of high-grade copper & welded to the copper fins with the State of the Art ULTRASONIC WELDING process to ensure superior conductivity of heat & long life of absorber plate. The absorber plate shall be selectively coated with a very special NALSUN coating for efficient absorption of heat from the Sun-rays. The efficiency of the collectors has been specified as FR (Ta) = 0.72, FROL = 3.62 W/Sq. mtr/ °C. The outer dimensions of the collector box shall be 2080 mm x 1070 mm x 100 mm with Frame made out of Extruded aluminum sections of 16 SWG specifications (powder coated yellow). The insulating material in the collectors would be 50mm (bottom) and 25mm (sides) Rock-wool with thermal conductivity of 0.029W/mk and density 48kg/sq. cm. The top glass would be toughened clear glass of thickness 4.0mm, with 88% transitivity and be of a reputed make like ATUL. The **Collector stands** would be made of 40X40X4mm (min) thick MS angles with enamel paint covering. The Grommet & Glass beading shall be made out of High quality EPDM rubber for long life. All hardware used shall be of SS-304 or Zinc Plated steel. The solar collector shall be arranged on roof in such a way so that the shadow of the collectors/ parapet etc can be avoided. The outer sides shall be having a Powder Coated finish in Yellow colour. The collector should have very high Absorbivity of > 0.95 % & Emissivity < 0.2 %. Anti-Condensation breather outlet shall be incorporated at rear bottom of collector to drain out condensed moisture if any. This prevents the inner glass surface from Fogging.

**Tank specifications:** The Insulated Hot Water Tank shall be of the Vertically oriented cylindrical type made out of SS-304. ( 2-3 mm ) It shall be duly insulated with 100mm thick glass-wool insulation with thermal conductivity of 0.028 to 0.033 W/mk and density 48 kg/cu.m. This will be covered with Aluminium cladding of thickness #22 SWG along with chicken mesh and thin polythene sheet. There shall be a built in Heat Exchanger of multiple tube type made of SS-304 to transfer the heat to the water in the tank. This closed loop system shall be provided with a make up tank. Also provided shall be a sacrificial anode to prevent Galvanic Corrosion. Electrical backup of as required with SS/Cu Thermostat (range 30-80°C, 15A/250 VAC) shall also be provided.

The hot water from solar heater in case supply to water heater (geyser) the additional heating arrangement by electricity in the hot water storage tank is not required.

**LIST OF APPROVED MAKES: PLUMBING WORKS**

| Sl.No | Material   | Relevant IS Code | MANUFACTURERS  |
|-------|--|------------------|--|
| 1     | Vitreous China Sanitary ware   | 2556             | <i>Kohler, Roca, American Standards, TOTO, Falcon</i>                      |
| 2     | Vitreous China Sanitary ware - lower End   | 771              | <i>Parryware, Hindware, Kohler, Roca, American Standards, TOTO, Falcon</i> |
| 3     | Stainless Steel Sink   |                  | <i>Jayna, Neelkanth, Nirali, Selam Steel</i>                               |
| 4     | Plastic Seat Cover   |                  | <i>Kohler, Roca, American Standards, TOTO, Falcon</i>                      |
| 4     | Geyser   |                  | <i>Racold, Usha Lexus, Jaquar,</i>   |
| 5     | C.P. Fittings Mixer/Pillar taps Washers, C.P. brass accessories ,CP Angle Valve, Bibcocks, CP waste                  | 1795/4291/4 827  | <i>Kohler, Roca, American Standards, TOTO,</i>                             |
| 5(A)  | C.P. Fittings Mixer/Pillar taps Washers, C.P. brass accessories ,CP Angle Valve, Bibcocks, CP waste ware - lower End | 1795/4291/4 827  | <i>Jaquar, Kohler, Roca, American Standards, TOTO,</i>                     |
| 6     | Centrifugally /Sand cast iron pipes & fittings   | 3989/1729        | <i>Neco, SKF, HEPCO</i>  |
| 7     | G.I. Pipes   | 1239 Part I      | <i>Jindal-Hissar, Tata, Prakash-Surya</i>                                  |
| 8     | G.I. Fittings  | 1239 Part I      | <i>Unik, K.S., Zoloto,</i>   |
| 10    | Gunmetal Valves  | 778              | <i>Zoloto, Leader, Castle,Sant</i>   |
| 11    | Brass stop & Bib Cock/Pressure Release valve   | 781              | <i>Kohler, Roca, American Standards, TOTO, Falcon</i>                      |
| 12    | Ball valve with floats   | 1703             | <i>Zoloto, Leader, Sant,</i>   |
| 13    | Stoneware pipes & Gully Traps  | 651              | <i>IS Marked pipes, as approved by Engineer</i>                            |
| 14    | R.C.C. pipes   | 458              | <i>IS Marked pipes, as approved by Engineer</i>                            |
| 15    | C.I. Manhole Covers  | 1726             | <i>SKF, Neco, BIC, HEPCO</i>   |
| 16    | Water Tank   |                  | <i>Sintex,</i>   |
| 17    | Mirror   |                  | <i>Atul, Modi guard, Asahi, Saint Gobain</i>                               |
| 18    | Hand drier   |                  | <i>Kopal, Euronics, Utech</i>  |
| 20    | Insulation of Hot water pipes  |                  | <i>Vidoflex Insulation, Superlon, Thermaflex, Kaiflexkaimenn</i>           |
| 21    | PVC Rain Water Pipes.  |                  | <i>Supreme, Prince, Finolex,</i>   |
| 22    | D.I pipes  |                  | <i>Jindal, Tata, Electrosteel,</i>   |
| 23    | Sluice valve / NRV   |                  | <i>Kilburn, Zoloto, Leader, L&amp;T, Castle</i>                            |
| 24    | Water supply pumps   |                  | <i>Crompton (CG), GRUNDFOS, KSB, Mather &amp; Platt, Kirloskar</i>         |
| 25    | DI Manhole Cover   |                  | <i>SKF,NECO,BIC,</i>   |
| 26    | Submersible pumps  |                  | <i>GRUNDFOS, KSB, Mather &amp; Platt, Kirloskar</i>                        |
| 27    | PVC/UPVC pipes & fittings  |                  | <i>Finolex , Prince, Supreme</i>   |

|    |  |                 |  |
|----|--|-----------------|--|
| 28 | Chlorinator  |                 | Siemens, Watcon, Ion exchange, oxybee,   |
| 29 | HDPE Solution tank   |                 | WATCON, ION EXCHANGE, Water Supply Specialist P (Ltd), Pollucon Technology         |
| 30 | Infrared Sensor operated Faucets/Urinals                                   |                 | Kohler, Roca, American Standards, TOTO, Falcon                                     |
| 31 | Gratings, Strainers, Cleanouts etc   |                 | Neer Brand (Sage Metals), ACO  |
| 32 | Level controller   |                 | 21st Century/ Advance Auto/ Shridhan international/ Minilec/ radar/ Femac/ Switzer |
| 33 | Drainage Pumps   |                 | Grundfos, KSB, Mather & Platt, Kirloskar   |
| 34 | Water / Sewage Treatment Plant   |                 | Geo Miler & Co, Ion-Exchange, Pollucon Technologies, Thermax, Oxybee, Enzotech     |
| 35 | Decorative bath room fittings  |                 | Kohler, Roca, American Standards, TOTO, Falcon                                     |
| 36 | R.O System   |                 | Ion-Exchange, Pentair, Pollucon Technologies, Thermax,                             |
| 37 | PE-AL-PE   |                 | Kitec, Jindal, PRINCE  |
| 38 | HDPE pipes and fittings  | IS:14333 (1996) | Oriplast, So-Soon, Finolex, AKG  |
| 39 | CPVC pipe, fittings and Solvent  |                 | Astral, Finolex, Ashirwad , AKG  |
| 40 | Solar Panel  |                 | Maharshi Solar, Inter solar, EMMVEE SOLAR SYTEMS                                   |
| 41 | Copper Pipe  |                 | Raj Co., Maxflow, Viega  |
| 42 | Copper Fittings  |                 | Raj Co., Maxflow, Viega  |
| 43 | Lab drainage   |                 | Viega, Duraline, So-Soon,  |
| 44 | Lab Fittings   |                 | Viega, Duraline, So-Soon,  |
| 45 | SS pipe(EN-10312) & press type fitting                                     |                 | Viega, Jindal  |
| 46 | Poly propylene- Random - Co - Polymer (PPR) pipes & Fittings               | 15801           | SFMC, Finolex, Supreme   |
| 47 | Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside | IS:15905        | Saint Gobain, Neco, HEPCO, SKF,  |
| 48 | Oxilyte (Mixed Oxidant)  |                 | Oxybee Solutions, I2M Technologies, Faith Innovations                              |

**Note :**

- Equivalent make of any item may be added with price adjustment with the approval of Engineer.
- Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of Engineer.

**LIST OF APPROVED MAKES : FIRE FIGHTING WORKS**

| Sl.No | Material   | Relevant Code | ISI | MANUFACTURERS   |
|-------|--|---------------|-----|---|
| 1     | G.I./M.S. Heavy class pipe                             | 1239/3589     |     | Jindal-Hissar, Tata, Surya- Prakash                                 |
| 2     | Gate Air Valve   |               |     | Leader, Zoloto, Castle, Sant  |
| 3     | Butterfly valves                                       | 13095         |     | Audco, KSB, C & R, Zoloto, Castle                                   |
| 4     | Portable Fire Extinguisher                             | 2171          |     | Minimax, Safex, Ceasefire, Newage, Safe guard, Kanex                |
| 5     | First aid Fire hose reels                              |               | 884 | Minimax, Safex, Ceasefire, lifeguard Newage, Safe guard,            |
| 6     | Fire hose pipes  | 636           |     | Newage, Minimax, Safex, Ceasefire,                                  |
| 7     | Fire Hydrant valves                                    | 5290          |     | Minimax, Newage, lifeguard Safex, Ceasefire, Safe guard, life guard |
| 8     | Sprinkler Heads  |               |     |   |
| A     | Pendent type   | IS            |     | Tyco, Viking, HD, Grinnel, lifeguard                                |
| B     | Side wall type   | IS            |     | Tyco, Viking, HD, Grinnel, lifeguard                                |
| C     | Sprinkler Side wall extended through                   | IS            |     | Tyco, Viking, HD, Grinnel, lifeguard                                |
| 9     | Sluice and non return/ check valve foot valve strainer | IS            |     | I.V.C., Kilburn, Zoloto, castle, Sant ,KSB                          |
| 10    | Thermoplastic fire hose pipe                           | 1258          |     | Minimax, safex, Newage, lifeguard , Safe guard                      |
| 11    | Rubber hose 12/20mm dia                                |               |     | Dunlop, Good year, Jyoti Eversafe, Getech                           |
| 12    | Reinforced rubber lined/canvas                         |               |     | Newage, Jayshree, Safe guard  |
| 13    | Standby battery lead acid                              |               |     | Exide, Standard, Amco   |
| 14    | Horizontal centrifugal/Fire pumps                      |               |     | Mather& platt(WILO), GRUNDFOS, Kirloskar                            |
| 15    | Diesel engine  |               |     | Cummins, Ashok Leyland, Caterpillar, Kirloskar                      |
| 16    | Electric motors  |               |     | GEC, Siemens, NGEF, ABB, Crompton, Kirloskar                        |
| 17    | Electrical switch gear & starters                      |               |     | As per Electrical Works   |
| 18    | Cables   |               |     | As per Electrical Works   |
| 19    | Flow meter   |               |     | Scientific Equipment (P) Ltd. Hyderabad ,System Sensor / CPWD       |
| 20    | Suction strainer                                       |               |     | Leader, ZOLOTO, AUDCO, Castle                                       |
| 21    | Vibration eliminator connectors                        |               |     | Resistoflex , Kanwal, D.wren  |
| 22    | Single phase preventor                                 |               |     | L & T, GEC, SIEMENS   |
| 23    | G.I. Fittings  | 1239 Part I   |     | Unik, K.S., Zoloto, R   |

|    |  |  |   |
|----|--|--|---|
| 24 | Yard Hydrant Stand Post, 4 way suction |  | Eversafe, Minimax, lifeguard Newage, Safe guard   |
| 25 | DI pipes                               |  | Jindal, TATA, Electrosteel,   |
| 26 | Pipe coat material (Pipe protection)   |  | <i>Pypkote Integrated water proofing co. Madras/ coaltek Rustech products (P) Ltd. Syndcate Enclave, Dabri/Makphall</i> |
| 27 | Fire Man's Axe                         |  | <i>Safeguard/safex/Newage/Gunnebo, lifeguard</i>  |
| 28 | Pressure guage                         |  | <i>IS:C3624 (cl-1) H.GURU/Fiebig/BRC/HD</i>   |
| 29 | Flow switch                            |  | <i>Potter/Safex system sensor/Jhonson control/Rapid flow</i>  |
| 30 | Pressure switch                        |  | <i>Indfoss/switzer, Equivalent make approval of Engineer</i>  |
| 31 | Fire suppression system                |  | <i>SVS Buildwel (p) ltd , Equivalent make approval of Engineer, Kanex</i>   |

**Note :**

- **Equivalent make of any item may be added with price adjustment with the approval of Engineer.**
- **Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of Engineer**



## GENERAL SCOPE OF WORK

The scope of work shall cover internal and external electrical works for **CONSTRUCTION OF HOSPITAL & Academic Campus at AIIMS Guntur** . The scope of work covers electrical equipments as per BOQ. Also, supply, installation, testing and commissioning of electrical works of the project including the following main items/systems:

- i. Rising mains, MV Panels.
- ii. MCB Distribution Boards.
- iii. UPS
- iv. Internal electrification through concealed MS conduit and provide light points, fan points, socket outlets etc. including supplying, installation, testing and commissioning of light fixtures, fans etc.
- v. Conduiting and wiring for telephone points including Main Telephone Distribution Boards (Tag Blocks), telephone outlets etc. complete with telephone cabling from tag blocks to telephone & telephone instruments etc.
- vi. Addressable Fire Detection & Alarm System consisting of Main Fire Control & Indicator Panel, Smoke & Heat Detectors, Manual Call Points Hooter etc. including conduiting/wiring & cabling complete.
- vii. Conduiting and wiring for cable TV.
- viii. Conduiting for computer networking.
- ix. Public Address System
- x. CCTV.
- xi. Nurse Call System.
- xii. Lifts,
- xiii. LT Cabling.
- xiv. Earthing, safety equipments and misc items required for electrical installation complete in all respect.
- xv. Lightning protection system consisting of lightning arrestor, finial, horizontal and vertical strips, test joints, earth electrodes etc.
- xvi. Audio Visual System For Lecture Rooms & Auditorium.
- xvii. Light Control .
- xviii. Access Control
- xix. Any other items/ works required for the completion of electrical work.
- xx. Enhancement/Sanctioning Electrical Load from State Electricity Board.
- xxi. Submission of GA drawings of electrical equipments and getting approvals from Client/HSCC/Owner before manufacturing/fabrication.
- xxii. Obtaining approvals from Chief Electrical Inspectors, Local Electricity Supply Authority, Telecom Department, and any other statutory authorities for the complete scope.
- xxiii. Contractor shall submit equipment drawing from manufacturer along with the layout etc. and working drawings for approval from HSCC Electrical Engineer before manufacture / commencement of work at site.
- xxiv. Contractor has to submit the working drawing of internal & external electrification based on our tender drawings for the approval of HSCC Electrical Engineer before commencement of work.
- xxv. Contractor has to take the approval of DB schedule/drawing of each DB from HSCC.
- xxvi. If, details of any electrical item/ system are left out, then kindly refer the CPWD specifications & approval from Engineer.
- xxvii. If any item describe in BOQ or specifications are favoring particular make the equivalent model of approved make in the list of approved makes can be accepted.

## 2.0 REGULATIONS AND STANDARDS

2.1 All equipments their installation, testing and commissioning shall conform latest CPWD/ IS specifications in all respects. Indian Standard Code of Practice for Electrical Wiring Installation IS:732-1989. It shall also be in conformity with Indian electricity Rules and the Regulations, National Electric Code, National Building Code, latest CPWD specifications amended up to date and requirements of the Local Electric Supply Authority. In general, all materials equipment and workmanship shall conform to the Indian Standards specifications and code. Mode of all measurement will be as per latest CPWD norms/ specifications Some of the applicable codes/standards are as under:

|    |   |                                    |
|----|---|------------------------------------|
| a) | CPWD General specifications for electrical works  | Part-I (Internal)- 2013            |
| b) | CPWD General specifications for electrical works  | Part-II (External)-1995            |
| c) | CPWD General specifications for electrical works  | Part-III (Lifts & Escalators)-2003 |
| d) | CPWD General specifications for electrical works  | Part-IV (Substation)-2007          |
| e) | CPWD General specifications for electrical works  | Part VII (DG Sets) 2006            |
| f) | CPWD Specification/norms for measurement  | Latest revision                    |
| g) | Guide for marking of insulated conductors   | IS 5578                            |
| h) | Guide for uniform system of marking and identification of conductor and apparatus terminals.    | IS 11353                           |
| i) | Low voltage switchgear and control gear assemblies  | S 8623 Part-1 to 3                 |
| j) | Specification for low voltage switchgear and control gear                                       | IS 13947                           |
| k) | Enclosed distribution fuse boards and cutouts for voltages not exceeding 1000V AC and 1200 V DC | IS 2675                            |
| l) | Code of practice for selection, Installation and  | ISI 10118 Part – 1 - 4             |

|     |  |  |                       |
|-----|--|--|-----------------------|
|     | maintenance of switchgear and control gear.  |  |                       |
|     |  |  |                       |
| m)  | Low-voltage fuses for voltages not exceeding 1000V AC or 1500V DC  |  | ISI13703 Part-1&2     |
|     |  |  |                       |
| n)  | PVC insulated (heavy duty) electric cables   |  | IS 1554               |
|     |  |  |                       |
| o)  | PVC insulated cables for working voltages upto and including 1100V.  |  | IS 694                |
|     |  |  |                       |
| p)  | Conduit for electrical installations   |  | IS 9537               |
|     |  |  |                       |
| q)  | Accessories for rigid steel conduits for electrical wiring   |  | IS 3837               |
|     |  |  |                       |
| r)  | Boxes for the enclosure of electrical accessories  |  | IS 14772              |
|     |  |  |                       |
| s)  | General and safety requirements for luminaries   |  | IS 1913               |
|     |  |  |                       |
| t)  | Code of practice for earthing  |  | IS 3043               |
|     |  |  |                       |
| u)  | Electrical accessories – circuit breakers for over current protection for household and similar installations.   |  | IS 8828               |
|     |  |  |                       |
| v)  | Low voltage switchgear and control gear  |  | IS 13947 part 1 – 5   |
|     |  |  |                       |
| w)  | Residual current operated circuit breakers   |  | IS 12640              |
|     |  |  |                       |
| x)  | Current Transformers   |  | IS 2705               |
|     |  |  |                       |
| y)  | Voltage Transformers   |  | IS 3156               |
|     |  |  |                       |
| z)  | Direct acting indicating analogue electrical measuring instruments and their accessories   |  | IS 1248 part – 1 to 9 |
|     |  |  |                       |
| A1) | Control Switches (switching device for control and auxiliary circuits including contactor relays) for voltages upto and including 1000V ac and 1200V DC. |  | IS 13947 & IS 1336    |
|     |  |  |                       |

|     |                                   |  |          |
|-----|-----------------------------------|--|----------|
| B1) | ONAN Transformer                  |  | IS 1180  |
|     |                                   |  |          |
| C1) | Energy Conservation Building code |  | (Latest) |

In case of contradiction in specification the priority of the documents shall be as follows:

CPWD/ IS specification, BOQ, drawings, Technical specifications

# **TECHNICAL SPECIFICATIONS**

## **SUB-HEAD: A. CONDUIT, ACCESSORIES & FIXING ARRANGEMENT**

### **1. RIGID PVC CONDUIT & ACCESSORIES**

PVC conduits shall be high impact, rigid, FRLS PVC, heavy-duty type and shall comply with relevant Indian Standards.

Conduits upto 32mm dia shall be 2mm thick and above that shall be 2.5mm thick.

Plain conduits shall be jointed by slip type of couplers with approved sealing cement. All conduit entries to outlet boxes are to be made with adaptors female thread and screwed male bushes. Conduit fittings and accessories such as inspection boxes, draw boxes and junction boxes shall be of heavy duty rigid PVC installed in such a manner that they can remain accessible for existing wires or for the installation of the additional wires. Fan hook box shall be of M.S. Inspection boxes shall be covered with suitable covers.

Conduit runs shall be so arranged that the cables connected to separate main circuits shall be enclosed in separate conduits and that all lead and return wires of each circuit shall be run with the same circuit.

PVC conduits shall be smooth in bore, true in size and all ends where conduits are cut shall be made carefully smooth. Sharp edges shall be trimmed. All joints between lengths of conduits or between conduits and fittings and boxes shall be held firmly together and glued properly. All joints shall be fully water tight. All jointing of PVC conduits shall be by means of adhesive jointing.

### **2. RIGID MS CONDUIT/ GI CONDUIT & ACCESSORIES**

Rigid MS conduits shall conform to relevant Indian Standards. MS ERW conduits protected inside & outside by black stove enamel shall be used as called for in the schedule of quantities.

Conduit upto 32mm dia shall be of 16 G and above that shall be of 14 G.

Joints between conduits and accessories shall be securely made, to ensure earth continuity (screwed joints). All joints shall be fully watertight. Threads and Sockets shall be free from grease and oil.

Conduit fittings and accessories such as inspection boxes, draw boxes and junction boxes shall be of C.I. for concealed conduiting and shall be of M.S. for surface conduiting. Fan hook box shall be of M.S. Inspection boxes shall be covered with 16 G GI covers. All conduit accessories shall be threaded type only.

Conduit runs shall be so arranged that the cables connected to separate main circuits shall be enclosed in separate conduits and that all lead and return wires of each circuit shall be run with the same circuit.

MS conduits shall be smooth in bore, true in size and all ends where conduits are cut shall be made carefully smooth. Sharp edges shall be trimmed. All joints between lengths of conduits or between conduits and fittings and boxes shall be held firmly together and screwed properly. Connection between screwed conduit and sheet metal boxes shall be by means a brass/ GI hexagonal check nut fixed from inside the box and another check nut from outside the box. Smooth PVC bushes from inside the box to be used to avoid damage to wires.

GI conduits if called for in the schedule of quantities shall conform to relevant Indian Standards. These conduits shall be protected by hot dip galvanized coating both inside and outside.

### **3. FLEXIBLE CONDUITS**

Flexible conduits shall be made of heavy gauge MS strip galvanized after making the spiral. Both edges of the strip to have interlocking to avoid opening up.

#### 4. LAYING/ FIXING OF CONDUITS.

Conduits shall be installed so as to avoid steam and hot water pipes. Conduits for LV systems shall be at least 150mm away from the electrical conduits.

Wires shall not be drawn into conduits until the conduits are erected, firmly fixed and cleaned out. Not more than two right angle bends or the equivalent shall be permitted between draw or junction boxes. Bending radius shall not be less than 2.5 times the outer diameter of the conduit.

Conduits concealed in the ceiling slab shall run parallel to walls and beams and conduit concealed in the walls shall be vertical or horizontal.

The chase in the walls required for the recessed conduit system shall be neatly made and shall be of ample dimensions to permit the conduits to be fixed in the manner desired. Conduits in chase shall be held by steel clamps of approved design. The chase shall be filled up neatly after erection of conduits and brought to the original finish of the wall with cement plaster/ cement concrete. The spacing between each clamp shall be 60 cm center to center.

Surface conduits shall be fixed by means of spacer bar saddles at intervals of not more than 500 mm from both sides of fittings/ accessories. The saddles shall be of 3mm x 19mm galvanized M.S. flat properly treated, primed and painted securely fixed to support by means of nuts & bolts/ raw plugs and brass machine screws.

Where conduits cross expansion joints in the buildings, adequate expansion fittings shall be used to take care of any relative movement.

Separate conduits shall be laid for the following systems:

- a) Normal light, Fan and 6 A socket outlets.
- b) Power points.
- c) TV outlets.
- d) PA/ Paging system.
- e) Telephone points and Data Points
- f) Fire alarm system.
- g) UPS points.
- h) CCTV System
- i) Access Control System
- j) Emergency Lighting

Contractor shall submit the conduiting layout to PMC/ Owners for approval before start of work. While laying conduiting, care should be taken that water, mortar and dirt etc. do not enter the conduits and boxes.

Conduiting system should be such that it shall facilitate easy drawing of new wires/ additional wires at any stage. All junction boxes/ pull boxes/ draw boxes shall be completely accessible for inspection, maintenance or for future expansion. While drawing of wires, care shall be taken to avoid damage to the wire insulation.

All joints in the wiring shall be made only at switches, distribution boards, socket outlets, lighting outlets and switch boxes only. No joint shall be made in conduits and junction boxes.

#### 5. FAN HOOK BOX:

- Recessed Fan hook box shall be fabricated from 16G 'MS' sheet Anodized.
- Fan hook box shall be Hexagonal in shape with 75mm depth & 150mm diameter.
- The fan fixing rod shall be 'U' shaped, 12mm dia 'MS' Anodised, welded to the box with minimum 150mm projection on either side.

## **SUB-HEAD: B. WIRING AND WIRING ACCESSORIES**

### **1. GENERAL**

- All the internal wiring shall be with 450/ 750 V grade, single core FR-LSH, PVC insulated, unsheathed multi-stranded electrolytic grade annealed bare copper conductor wires confirming to IS: 694/2010 amended & revised to date and wiring installation should conform to IS: 732.
- Multicore flexible cables shall be 450/ 750V, multicore, PVC insulated, FR-LSH PVC Sheathed, multi-stranded, electrolytic grade annealed bare copper conductor flexible cables conforming to IS:694/ 2010.

### **2. COLOUR CODING**

Colour coding of wiring shall be done as per IS specifications, for identification of different circuits and phases. All wiring shall be in concealed or surface conduits as called for.

In three phase feeder circuit, three phase wire, with or without neutral wire, shall be taken through any single conduit. In lighting and power socket outlets wiring, in no case two lives wires of different phases shall be drawn through the same conduit.

### **3. SWITCH**

All switches shall be connected to live wire and neutral of each circuit shall be continuous everywhere having no fuse or switch installed in the line except at the main switch board.

### **4. INSTALLATION**

The conduits and wiring installation are to be installed such that modifications or repairs can be carried out in future without disturbing the building fabric in any way.

For wiring accessories partly recessed in wall, special care must be taken to ensure that the final position of all switch\ socket plates are set symmetrical with the pattern of the wall finish as required by the architect. All switch socket-mounting plates shall be set square to the vertical and horizontal axis.

### **5. FISH WIRE**

GI Fish wire/ Pull wire of 14G shall be provided in the recessed conduiting to facilitate pulling of wires through conduits.

### **6. INSPECTION BOXES**

Inspection boxes/ Pull boxes shall be provided as required and approved by the Architect/ Consultant for pulling of wires through conduiting network. Rigid PVC boxes shall be used for the PVC conduiting and G.I. boxes of suitable size and depth shall be used for MS/ GI conduiting.

### **7. JOINTS**

Only looping system of wiring shall be used. Wires shall not be jointed/ taped. All joints shall be made at switches, sockets outlets, distribution boards and lighting points. No joints shall be made inside conduits and in junction boxes. Suitable sizes connectors to be used at light fixtures. No reduction of strands is permitted at terminations. Before connections, copper conductor wire ends shall be properly soldered (at least 20-mm length). Terminals shall have adequate cross-sectional area to take all strands. No wire smaller than 1.5 sq.mm shall be used.

### **8. IDENTIFICATION**

Identification ferrules indicating the circuit and D.B. number shall be used for sub mains and sub-circuit wiring. The Ferrules shall be provided at both ends of each sub-main and sub-circuit.

### **9. CIRCUITS OF DIFFERENT PHASES & DIFFERENT DB's**

Where single-phase circuits are supplied from a three phase and neutral distribution board, no conduit shall contain the wiring of different phases. Circuits fed from distinct sources of supply\ from different distribution boards or MCB's shall not be bunched in one conduit.

### **10. LOAD BALANCING, CONTROL & EARTH WIRE**

Load Balancing of circuits in three-phase installation shall be arranged before installation is taken up. The earth continuity green FRLS PVC insulated copper wire for individual circuits of light/ power/ UPS should be laid. From D.B. each circuit will have separate earth wire. Earth wire shall be run inside the conduit to earth the third pin of socket outlets, earth terminal of light fixtures & fans etc. & earth

terminals of outlet box as required. Light points shall be either of single control, twin control & multiple points controlled by a single switch/ MCB as per schedule of works. Insulated copper wire for earthing as specified in the item of work shall be provided with each circuit and terminated in the earth bar of DB's/ Switch boxes with proper lugs, as required.

#### 11. CONDUIT FILL

Number of wires in each conduit shall be drawn as per chart given below:

MAXIMUM PERMISSIBLE NUMBER OF 1100 V GRADE FRLS PVC INSULATED COPPER CONDUCTOR WIRES THAT CAN BE DRAWN INTO METALLIC AND NON METALLIC CONDUITS:

**Maximum permissible number of Single-core cables upto and including 1100V that can be drawn into Rigid steel and Rigid Non-metallic conduits**

| Nominal cross sectional area in sq.mm | 20mm |   | 25mm |    | 32mm |    | 40mm |   | 50mm |   | 60mm |   |
|---------------------------------------|------|---|------|----|------|----|------|---|------|---|------|---|
|                                       | S    | B | S    | B  | S    | B  | S    | B | S    | B | S    | B |
| 1.0                                   | 7    | 5 | 13   | 10 | 20   | 14 | -    | - | -    | - | -    | - |
| 1.5                                   | 7    | 5 | 12   | 10 | 20   | 14 | -    | - | -    | - | -    | - |
| 2.5                                   | 0    | 5 | 10   | 8  | 18   | 12 | -    | - | -    | - | -    | - |
| 4.0                                   | 4    | 3 | 8    | 7  | 12   | 10 | -    | - | -    | - | -    | - |
| 6.0                                   | 3    | 2 | 6    | 5  | 10   | 8  | -    | - | -    | - | -    | - |
| 10                                    | 2    | - | 4    | 3  | 6    | 5  | 8    | 6 | -    | - | -    | - |
| 16                                    | -    | - | 2    | -  | 4    | 3  | 7    | 6 | -    | - | -    | - |
| 25                                    | -    | - | -    | -  | 3    | 2  | 5    | 4 | 8    | 6 | 9    | 7 |
| 35                                    | -    | - | -    | -  | 2    | -  | 4    | 3 | 7    | 5 | 8    | 6 |

#### Notes:

- The above table shows the maximum capacity of conduits for a simultaneously drawing of cables. The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from the straight by an angle of more than 15°. The columns headed 'B' apply to runs of conduit, which deflect from the straight by an angle of more than 15°.
- In case an inspection type draw in box has been provided and if the cable is first drawn through one straight conduit, then through the drawn in box and then through the second straight conduit, such systems may be considered as that of a straight conduit even if the conduit deflects through the straight by more than 15°.

#### 12. WIRING AND EARTHING NORMS

Light Points, 6 A sockets and fans points may be wired on a common circuit. Not more than 10 light points, 6 A sockets and fan points and a load not exceeding 800W be connected on a lighting circuit unless it is specified otherwise on the drawings/ in the schedule of quantities. It will however, be preferred to have separate circuits of 6A sockets as may be required by the consultant. Size of the earth wire shall be of the same size as that of the live/ phase conductor unless specified otherwise. It shall however, be ensured that in one switchboard, only one circuit is terminated. For different circuits, separate switch boards shall be used. Each power circuit shall be wired as specified in drawings/ schedule of quantities. Not more than two power points 6A/16A sockets shall be connected on one power circuits unless specified differently in the drawings/ schedule of quantities.

UPS circuits shall start from the UPS DB's. UPS points will have two insulated green earth wires, one for the earthing of the 3<sup>rd</sup> pin of the socket and other for the earthing of the outlet box/ furniture.

The smallest copper conductor to be used for lighting circuits shall be of 1.5/ 2.5 sq. mm (as specified in the schedule of quantities) and for power circuit 4 sq. mm respectively. Wiring shall be done in the looping system. Phase or live conductor shall be looped at the switch box and neutral conductor can be looped from the light, fan or socket outlet. Neutral conductor and earth continuity wire shall be brought to each switchboard situated in rooms/ halls. These shall be terminated inside the switchboards with suitable connectors.



## **SUB-HEAD: C. SWITCHES, SOCKETS & ACCESSORIES**

### **1. MODULAR GRID SWITCHES & PLATES**

All 6 Amps, 16 Amps & 13 Amps switches shall be clip in switch modules. Switches shall be with positive action rockers clipped on to modular front plates and shall be suitable for 230/ 250 volts AC. Switches & plates shall be made out of Fire retardant UV stabilized Engineering thermo plastic (grade poly carbonate). All modular plates shall be fixed to the switch boxes with brass screws, leaving ample space at the back and sides for accommodating wires. Switches and Sockets shall have Silver Cadmium contacts for long life. Live terminals should be shrouded for finger protection. All switches shall conform to IS: 3854 amended and revised to date. Switches controlling the lights shall be connected to the phase wire of the circuit. Switches & Plates shall confirm to IP: 20

### **2. MODULAR GRID SOCKET OUTLETS**

All 6 Amps, 16 Amps & 13 Amps socket outlets shall be clip in modules, clipped on to modular front plates and shall be 3/5/6/ multi pin round or flat pin or international or multi pin type as called for in the Schedule of Quantities. Socket outlets and plates shall be made out of Fire retardant UV stabilized Engineering thermo plastic (grade poly carbonate). GI outlet box shall have an earth terminal. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

Switches and Sockets shall have Silver Cadmium contacts for long life. Live terminals should be shrouded for finger protection.

All 3 pin/ 5pin/ 6 pin/ international/ multi pin socket outlets shall be with child resistant shuttered system.

All socket outlets shall be suitable for 230V/ 250V AC AC supply.

Each socket outlet shall be controlled by a switch. The switch controlling socket outlet shall be on live side/ phase wire of the circuit. All switches shall confirm to IS: 3854 and socket outlets to IS: 1293 amended and revised to date. Sockets shall confirm to IP: 20

### **3. MODULAR GRID FAN REGULATORS & DIMMERS**

Fan regulator shall be clip in modular type suitable for 230V/ 250V AC. The minimum rated power shall be 120W. The regulator shall be totally hum free. The fan regulator shall have "Off" position. The fan regulator shall be clipped on to modular front face plate.

The dimmer shall be clip in modular type suitable for 230V/ 250V AC. The minimum rated power shall be 400W. The dimmer shall have "Off" position. The dimmer shall be clipped on to modular front face plates.

These shall be made of Fire retardant, UV Stabilized, and engineering thermo plastic. Dimmers and fan regulators operation should not interfere with radio & TV signal. Diameter & fan regulator shall confirm to IP:20.

### **4. MODULAR GRID COMMUNICATION OUTLETS**

TV, Tele & Data outlets shall be modular type clipped on to suitable modular front plates on suitable outlet boxes. These are made of engineering thermo plastics. TV outlet shall be Co-axial, Silver plated for minimal signal loss.

Tele Jack, (RJ-11) shall accept minimum 2 lines, gold plated contacts for better voice clarity and with spring loaded shutter for dust protection. Data outlet (RJ 45) shall be able to accept Cat 6 cable, gold plated contacts for better data transfer efficiency and spring loaded shutter for dust protection.

### **5. METAL OUTLET BOXES**

1 MM thick pre-galvanized sheet outlet boxes of suitable size as per the requirement of modular front plate shall be used. The outlet box shall be of minimum depth of 50mm unless otherwise specified differently. GI outlet box shall have a brass earth terminal.

### **6. PLASTIC OUTLET BOXES**

Plastic enclosures/ outlet boxes where ever required shall be of suitable size as required for the switch/ socket front face plates and shall be made of UV stabilized engineering plastics.

**7. TYPE OF MODULAR GRID SOCKET OUTLETS (to be used as specified in the B.O.Q.)**

- a. 6 Amps. 3 Pin, Round Pin
- b. 6 Amps. 5 Pin, Round Pin
- c. 16 Amps. 3 Pin, Round Pin
- d. 6A/16 Amp. Combined, Round Pin
- e. 13 Amps. 3 Pin, Flat Pin
- f. 13 Amps. Multi-standard, International/ Intel Socket

**8. INDUSTRIAL PLUGS & SOCKETS & MOBILE PLUG & SOCKETS**

Industrial plug & sockets & mobile plug & socket shall be:

- 3 Pin, 230V/ 250V (P, N, E), Round (Single phase + Neutral + Earth).
- 4 Pin, 415V (3P, E), Round (Three phase + Earth).
- 5 Pin, 415V (3P, N, E), Round (Three phase +Neutral + Earth).

As called for in the schedule of quantities.

Industrial plug & sockets mobile plug & sockets shall be 16A, 20A, 32A, 63A & 125A 1 Phase & 3 Phase rating.

Industrial plug & sockets shall be suitable for recessed and surface mounting.

Plug & sockets shall be made of high quality engineering thermoplastics (high quality polycarbonate).

The housing shall be either powder coated sheet steel enclosure of 14G or of the same material as high quality polycarbonate as called for in the schedule of quantities.

IP Rating of Plug, Socket & Enclosure:

IP rating of complete assembly i.e. plug & socket unit enclosure shall be:

- Plastic Plug & socket in metal enclosure: Plastic P&S IP 44 & metal enclosure IP 30.
- Plastic Plug & socket in polycarbonate enclosure: IP 66 or IP 67 as called for in the BOQ.
- Plastic Plug & socket assembly with protection shall be complete with a DIN channel for mounting of DP MCB/ 4P MCB/ DP RCBO/ 4P RCBO as shall have required rating of MCB's/ RCBO's as called for in the schedule of quantities.
- Plastic Plug & socket without MCB/ RCBO, shall be with rotary ON/ OFF switch as called for in the schedule of quantities.

Note: All external area/ all wet area shall have minimum IP66 or IP67 rating plug, socket & enclosure as complete assembly.



The cables should meet circuit integrity at 1000 volts with simultaneous action of Fire, Impact & water on single sample when tested in accordance to category-3 of BS 8519:2010 when tested in accordance to BS 8491 & BS EN 50200 PH-120.

The cables should not emit toxic gases in case of fire. The toxicity index should be less than 3 (refer NES 713).

The cables should comply with the requirements of IEC-61034 Part 1&2 (Measurement of Smoke density of cables burning under defined conditions).

The cables should comply with the requirements of BS EN 60754 (Determination for amount of halogen acid gas content which shall not be greater than 0.5%)

Fire & type test reports of each lot from 3rd party inspection agency required prior to despatch.

### **3. CABLE LAYING AND HANDLING**

It should be ensured that both ends of the cable are properly sealed to prevent ingress/ absorption of moisture.

### **4. CABLE HANDLING**

When cable drums have to be moved over short distance, they should be rolled in the direction of the arrow marked on the drum.

While removing cables, the drums shall be properly mounted on jacks or on a cable wheels or any other suitable means, making sure the spindle, jack etc. are strong enough to take the weight of the drum.

The cables shall not be given a sharp bend to a small radius. The minimum safe bending radius for all types of PVC/XLPE cables shall be taken as 12 times the overall diameter of the cable. Wherever practicable, larger radius should be adopted. At joints and terminations, the bending radius of individual cores of a multicore cable shall not be less than 15 times its overall diameter.

Cable with kinks and straightened kinks, or with similar apparent defects like defective armoring etc. shall not be installed/ laid.

Cables of different voltages as well as power and control cables should be kept in different trenches/ racks with adequate separation. Where available space is restricted, LV/MV cable shall be laid above HV cables.

Where cables cross over cannot be avoided, the cable of higher voltage shall be laid at a lower level than the cable of lower voltage.

Installation of cables including jointing shall be carried out as per IS: 1255 amended and revised to date.

Power and communication cables shall, as far as possible cross at right angles. Where power cables are laid in proximity to communication cables, the horizontal and vertical clearances shall not normally be less than 60 cm.

Cables shall be laid direct in ground, in pipes/ closed ducts, in open ducts or on surface depending on environmental conditions, and as required in schedule of quantities.

During the preliminary stages of laying the cable, consideration should be given to proper location of the joint position so that when the cable is actually laid, the joints are made in the most suitable places and as approved by Consultant. As far as possible, water logged locations, carriage ways, pavements, proximity to telephone cables, gas or water mains, inaccessible places, ducts, pipes, racks, etc. shall be avoided.

The cable shall not in any circumstances be bent so as to form an abrupt right angle but must be rounded off at the corners to a radius not less than 12 times the overall diameter of the cable.

In case, where there are chances of any damage to the wiring/ cables, such wiring/ cables shall be covered with a sheet metal protective covering (not less than 16 SWG), the base of the covering being flush with the plaster or brickwork as the case may be, or the wiring/ cables shall be drawn through a heavy gauge metal conduit pipe by complying with all the requirements of conduit wiring system.

Such protective covering shall, in all cases, be fitted on all down drops within 1.5 m from the floor or from floor level upto the switch board, whichever is less.

While cutting and stripping of the outer sheathing of the cable, care shall be taken that the sharp edge of the cutting instrument does not touch the inner insulation of the conductors. The protective outer covering of the cable shall be stripped off near connecting terminal and this protective covering shall be maintained upto close proximity of connecting terminals. The cables laid near junction boxes shall be made moisture proof with a plastic compound.

## **5. CABLE JOINTING & TERMINATION**

Jointing shall be as per the manufacturer's recommendations using standard kits. Cable joints shall be made in suitable, approved cable joint boxes, jointing of cables in the joint boxes and filling of compound shall be done as per manufacturer's recommendations. Heat shrinkable joints shall be made.

Cables shall be terminated onto the terminals of switchgear through crimping lugs of proper size and of heavy duty. Cable lugs shall be fitted onto the cable by crimping or compression jointing.

Continuity of cable armouring is to be maintained. Double compression glands to be used. Proper crimping tools to be used.

## **6. TRENCHING & CABLE LAYING**

The minimum width of trench shall be 45 cm and depth shall be 75cm for laying of cable. Where more than one cable is to be laid in the same trench in horizontal formation, the width of trench shall be increased such that the minimum gap between the cables is one diameter of the cable unless specified otherwise.

The clearance between axis of the end cables and the sides of the trench shall be minimum 1.5 D (diameter) of the end cable.

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided.

Where gradients and changes in depth are unavoidable, these shall be gradual.

The bottom of the trenches shall be level and free from stone, brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 9 cm in depth.

Cable laid in trenches in a single tier formation shall have a covering of clean, dry sand of not less than 20 cms. above the base cushion of sand before the protective cover is laid.

In the case of vertical multi-tier formation, after the first cable has been laid, a sand cushion of 30 cms shall be provided over the initial bed before second tier is laid. If additional tiers are formed, each of the subsequent tiers shall have a sand cushion of 30 cms as stated above. The top-most cable shall have final sand covering not less than 17 cms before the protective cover is laid.

Unless otherwise specified, the cables shall be protected by second class bricks of not less than 20 cm x 10 cm x 10 cm (nominal size) as per CPWD building specification, or protection covers placed on top of the sand, (brick to be laid breadth wise) for the full length of the cable to satisfaction of the owner. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and project at least 5 cm over the sides of and cables.

The trenches shall be then back filled with excavated earth free from stone or other sharp-edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 cm. Unless otherwise specified, a crown of earth not less than 50 mm in the center and tapering towards

the sides of the trench shall be left to allow for subsidence. The crown of earth, however, should not exceed 10 cms.

Where road bends or lawns have been cut or kerb stones displaced, the same shall be repaired to the satisfaction of the architect and all surplus earth or rock removed to places as specified.

In locations such as road crossing, entry to building in paved areas etc. cables shall be laid in pipes or closed ducts.

All cable entry/ exit points into the building through pipe sleeves shall be properly sealed with water and fire safe sealants in an approved manner to avoid any seepage of water into the building.

Manholes of adequate size, as decided by the Architect, shall be provided to facilitate of adequate strength feeding/ drawing in of cables and to provide working space for persons. Suitable manhole covers with frame of proper design shall cover Manholes.

CABLE LOOPS: Sufficient cable loop length shall be left at both ends.

## 7. CABLES ON HANGERS OR RACKS/ TRAYS

The contractor shall provide and install all iron hangers racks, or racks with die-cast cleat, with fixing rag bolts or girder clamps or other specialist fixing as required.

Where hangers or racks are to be fixed to wall sides ceiling and other concrete structures, the contractor shall be responsible for cutting away, fixing and grouting in rag bolts and making good the damages as required.

The hangers or racks shall be designed to leave at least 25 mm clearance between the cables and the face to which it fixed. Multiple hangers shall have two or more fixing holes. All cables shall be saddled at not more than 500 mm intervals. These shall be designed to keep provision of some spare capacity for future development. Minimum spacing between the cables shall be one diameter of the cable or as specified.

## 8. CABLE TRAY

- a) The MS cable trays should have undergone rigorous rust proofing process, which should comprise of alkaline, degreasing, descaling in diluted sulphuric acid and a recognized phosphating process. The sheet work shall then be given two coats of oxide primer before two coats of final painting. Cable trays shall be either painted (Stove enameled) or hot dip galvanized as called for in the schedule of quantities.
- b) Cable trays shall be complete with bends, joints, coupler plates and accessories as may be required for joining the cable trays.
- c) Cable trays shall be either perforated or ladder type as called for in the schedule of quantities.

## 9. PERFORATED CABLE TRAYS

Standard Technical details of perforated cable tray shall be as follows:

| S. No. | SIZE OF TRAY<br>(Width) | THICKNESS & COLLAR<br>HEIGHT |
|--------|-------------------------|------------------------------|
| 1.     | 150mm to 450mm width    | 2mm thick & 50mm collar      |
| 2.     | 600mm to 750mm width    | 2mm thick & 50mm collar      |
| 3.     | 900mm to 1200mm width   | 3mm thick & 50mm collar      |

**Note:** Supports shall not be charged extra. It shall be considered to be included in the rate of the tray.

## 10. LADDER TYPE CABLE TRAYS

Standard technical details of ladder type cable trays shall be as follows:

| S. No. | SIZE OF TRAY    | SIZE OF MAIN CHANNEL OR RUNNER | SIZE OF RUNG & SPACING         | CABLE TRAY SUPPORT                    |
|--------|-----------------|--------------------------------|--------------------------------|---------------------------------------|
| 1.     | 900mm to 1500mm | 25 x 100 x 25 x 2.5mm          | 20 x 50 x 20 x 2.5mm @ 250 C/C | 50 x 50x 5mm angle @ 1000mm spacing.  |
| 2.     | 450mm to 750mm  | 20 x 75 x 20 x 2.0mm           | 20 x 50 x 20 x 2mm @ 250 C/C   | 40 x 40 x 5mm angle @ 1250mm spacing. |
| 3.     | 150mm to 300mm  | 20 x 75 x 20 x 2.0mm           | 15 x 35 x 15 x 2mm @ 250 C/C   | 40 x 40 x 3mm angle @ 1500mm spacing. |

Hangers shall be minimum 10mm dia GI Round bar.

Fixing/ supporting arrangement shall be as approved by the Consultant/ Owner/ PMC

Hardware to be used in cable tray system shall be galvanized or zinc passivated.

**Note: Supports shall not be charged extra. It shall be considered to be included in the rate of the tray. All structural steel shall be according to the latest revision of IS: 226 & 808.**

### a. Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS: 209-1992.

### b. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square meter shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs; rust stains bulky white deposits, blisters.

Mild steel flats/ wires shall undergo a process of degreasing, pickling in acid, cold rinsing and then galvanizing.

## 11. TESTING OF CABLES

The Megger value in normal dry weather shall be 50 mega ohm for 1.1 KV grade cable. Cables shall be tested at works for the following tests before being dispatched to site by the project team:

- Insulation Resistance Test.
- Continuity resistance test.
- Sheathing continuity test.
- Earth test. (in armoured cables)
- Hi Pot Test.

Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Owner's site representative:

- Insulation Resistance Test (Sectional and overall)
- Continuity resistance test.
- Sheathing continuity test.
- Earth test.

All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the PMC/ Owner representative.

## **12. CABLE TAGS**

Cable tags shall be made out of 2mm thick aluminum sheets. Each tag shall be 2" in dia or 3" x 3" square with one hole of 2.5mm dia, 6 mm below the periphery, or as approved by Consultant. Cable designations are to be punched with letters/ number punches and the tags are to be tied to cables with piano wires of approve quality & size. Tags shall be tied inside the panels beyond the glanding as well as above the glands at cable entries. Along trays tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 meters.

Cables shall be secured to cable trays with 3mm thick x 25mm wide aluminum strips/ suitable GI clamp, or as approved by Consultant, at 1000 mm intervals and screwed by means of rust proof screws, washers and bolts, of adequate but not excessive lengths. Cable trays for horizontal runs suspended from the ceiling will be supported with mild steel straps or brackets, at 1000 mm intervals and the overall tray arrangement shall be of a rigid construction. External cabling route marker with GI plate marked with "DANGER 1.1 kV CABLE" with 1 meter long GI angle iron grouting bracket including 1:3:6 ratio cement concrete base block of minimum size 200 x 200 x 350 mm to be provided or as approved by Elect. Supply Company.



## **SUB-HEAD: E. EARTHING**

### **1. SYSTEM OF EARTHING**

The system shall be TNS with 4 wires supply system (R, Y, B, N and 2 Nos. E) brought from the main LT Panel.

All non-current carrying metal parts of the electrical installation shall be earthed as per IS: 3043 – 1987 with latest amendment. All metal conduits, cable sheath, switchgear, DB's, light fixture, equipment and all other parts made of metal shall be bonded together and connected to earth electrodes. Earthing shall be in conformity with provisions of rules 32, 61, 62, 67 and 68 of Indian Electricity Rules, 1956.

All earthing conductors shall be of high conductivity copper or GI, as specified in the schedule of quantities & shall have protection against mechanical damage. The cross-sectional area of earth conductors shall not be smaller than half that of the largest current carrying conductor.

Main earthing conductors shall be taken from the earth connections at the main L T panel to an earth electrode with which the connection is to be made. All joints in tapes shall be with four rivets and shall be brazed in case of copper and by welding bolting in case of GI. Wires shall be connected with crimping lugs, all bolts shall have spring washers. Sub- mains earthing conductors shall run from the main distribution panel to the sub distribution panel. Final distribution panel earthing conductors shall run from sub-distribution panel.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution panel. Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to distribution panel at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord. Switches, accessories, lighting fitting etc. which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

- a. All Lighting fixtures, sockets outlets, fans, switch boxes and junction boxes etc. shall be earthed with copper wire as specified in schedule of quantities. The earth wire ends shall be connected with solderless/ bottle type copper lugs.
- b. All the earth wires in switch boxes, sockets outlets, DB's and light fixtures shall be of green Colour (PVC insulated).
- c. Main earth bus shall be taken from the L.T. switch board to earth electrodes. The electrical resistance of earthing conductors shall be low enough to permit passage of fault current necessary to operate fuse or circuit breaker, and it shall not exceed 1 ohm.

### **2. SIZING OF EARTHING CONDUCTORS**

The cross sectional area of earthing conductor shall not be smaller than half of the largest current carrying conductor subject to an upper limit of 80 Sq.mm. If the area of the largest current carrying conductor or bus bar exceeds 160 sq.mm then two or more earthing conductors shall be used in parallel, to provide at least half the cross sectional area of the current carrying conductor or bus bars. All fixtures, outlet boxes, junction boxes and power circuits upto 15 amps shall be earthed with PVC insulated copper wire.

All 3 phase switches and distribution panels upto 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper/ GI wires. All 3 phase switches and distribution panels upto 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper/ GI wires. All switches, bus bar, ducts and distribution panels of rating 200 amps and above shall be earthed with minimum of 2 nos separate and independent 25 mm x 3 mm copper/ GI tape.

Earthing details given in Table – A & B shall be referred to as a general guidance. Exact sizes to be worked out by the contractor as per relevant IS Codes.

**TABLE - A**

- (a) Size of earth leads  
For Transformer/Generator Neutral Point Earthing:

| Transformer/<br>DG Set<br>Rating | Electrolytic<br>Bare copper<br>Conductor Wire<br>or strip | Galvanized<br>Iron<br>Conductor wire<br>or strip |
|----------------------------------|---|--|
| 50KVA & below/4mm dia            | 4mm dia   | 25mm x 6.0mm                                     |
| 75 KVA                           | 25mm x 3.0mm  | 25mm x 6.0mm                                     |
| 100 KVA                          | 25mm x 6.0mm  | 32mm x 6.0mm                                     |
| 150 KVA                          | 25mm x 6.0mm  | 40mm x 6.0mm                                     |
| 200 KVA                          | 25mm x 6.0mm  | 40mm x 6.0mm                                     |
| 250 KVA                          | 25mm x 6.0mm  | 40mm x 6.0mm                                     |
| 300 KVA                          | 25mm x 6.0mm  | 40mm x 6.0mm                                     |
| 500 KVA                          | 40mm x 6.0mm  | 40mm x 6.0mm                                     |
| 750 KVA                          | 40mm x 6.0mm  | 50mm x 6.0mm                                     |
| 1000 KVA                         | 40mm x 6.0mm  | 50mm x 6.0mm                                     |
| 1250 KVA                         | 50mm x 6.0mm  | 50mm x 6.0mm                                     |
| 1500 KVA                         | 50mm x 6.0mm  | 75mm x 6.0mm                                     |
| 2000 KVA                         | 50mm x 6.0mm  | 75mm x 6.0mm                                     |

**NOTE:** - EXACT SIZE OF EARTH LEAD TO BE DETERMINED AS PER LATEST IS CODES.

**TABLE – B**

- (b) For Equipment Earthing (Applicable to Transformer, Generators, Switchgears, Panels, DB's, Motors etc.)

| Rating of<br>400-V, 3ph<br>50 cy. Equipment<br>In KVA | Bare Electrolytic<br>Copper conductor<br>Wire/ Strip | Galvanised<br>Iron Wire/ Strip |
|---|--|--------------------------------|
| upto 5  | 2mm dia  | 2mm dia                        |
| 6 to 15   | 3mm dia  | 3mm dia                        |
| 16 to 30  | 4mm dia  | 4mm dia                        |
| 31 to 50  | 6mm dia  | 6mm dia                        |
| 51 to 100   | 25mm x 3.0mm   | 25mm x 6.0mm                   |
| 101 to 125  | 25mm x 3.0mm   | 32mm x 6.0mm                   |
| 126 to 150  | 25mm x 3.0mm   | 32mm x 6.0mm                   |
| 151 to 200  | 25mm x 6.0mm   | 40mm x 6.0mm                   |
| 201 to 300  | 25mm x 6.0mm   | 50mm x 6.0mm                   |
| 301 to 500  | 32mm x 6.0mm   | 50mm x 6.0mm                   |
| 501 to 800  | 40mm x 6.0mm   | 50mm x 6.0mm                   |
| Above 800   | 50mm x 6.0mm   | 50mm x 6.0mm                   |

**NOTE:** EXACT SIZE OF EARTH LEAD TO BE DETERMINED AS PER LATEST IS CODES.

**NOTE:** ALL THREE PHASE EQUIPMENT SHALL BE DOUBLE EARTHED

### 3. PROHIBITED CONNECTIONS

Neutral conductor, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lighting protection system conductors shall not be used as an earthing conductor.

### 4. CONNECTION/ JOINTS

The earthing connections/ joints should be bolted, riveted, welded, brazed type.

In case of bolted joints, GI/ Passivated hardware's of adequate size/ nos. should be used for firm connections. The minimum contact area should be equal to the width of the strip or cross-sectional

area of earthing lead. Welded/ brazed joints should be smooth and continuous. All welded/brazed joints should be treated with anti-corrosive paints to protect it from corrosion/ rusting.

All bolted connections/ joints of Cu strip should be tinned.

Wherever, flexible earthing connection is must, it should be hydraulically crimped lugs of Copper/ Aluminum.

The effective earthing connection surface should be smooth & free from paints and oxide coatings.

## **5. EARTHING**

The following must always be ensured in earthing system:

- All earth pits should be at equi - potential. Main equipotential bonding conductors shall be provided.
- Extraneous conductive parts such as gas pipes, other service pipes and ducting risers and pipes of fire protection equipment and exposed metallic parts of the building structure shall be bonded to earth.
- The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.

## **6. RESISTANCE TO EARTH**

The resistance of earthing system shall not exceed 1 ohm.

### **SPECIFICATION FOR HOT DIP GALVANIZING PROCESS FOR MILD STEEL USED FOR EARTHING FOR ELECTRICAL INSTALLATION**

## **7. GENERAL REQUIREMENTS**

### **a. Quality of Zinc**

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS: 209-1992.

### **b. Coating Requirement**

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square meter shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs; rust stains bulky white deposits, blisters.

Mild steel flats/ wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing. Jointing of earthing tape shall be by welding. All joints and cut ends shall be properly painted with aluminum paint.

## **8. MAINTENANCE FREE CHEMICAL EARTHING:**

Maintenance Free Chemical Earthing shall be done strictly as per manufacturer's recommendations. It shall be completely maintenance free, long life close to 25 years, environmentally safe, non-corrosive & electrically conductive. The earth resistance results shall be less than one ohm.

## **SUB-HEAD: F. FINAL DISTRIBUTION BOARDS (FDB's)**

Final Distribution Boards (FDBs) shall be suitable for operation on 3 Phase/ single phase, 415/ 240 volts, 50 cycles, neutral grounded at transformer. The DB shall be minimum di-electric strength of 2.5 KV for 1 Sec. All Distribution Boards shall manufactured by a manufacturer listed in approved makes of material.

FDB's shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS: 13947-1993.

### **1. CONSTRUCTIONAL FEATURES**

FDB's shall be made out of 1.6 mm thick high quality CRCA sheet steel and shall be pre-treated and powder coated sheet steel used in the construction of FDB shall be folded and braced as necessary to provide a rigid support for all component. FDB shall be suitable for indoor/ outdoor installation as the case may be, wall mounting or free standing type as per requirement, in double door construction. The Final Distribution Boards shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket, padlocking arrangement. All removable/ hinged doors and covers shall be grounded by 4.0 sqm tinned stranded copper connectors. Final Distribution Boards shall be suitable for the climatic conditions/ site conditions. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS: 8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100 V AC.

All panels and covers shall be properly fitted and square with the frame and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self threading screws shall not be used in the construction of FDBs.

Knockout holes of appropriate size and number shall be provided in the FDB's in conformity with the location of cable/ conduit connections. Detachable sheet steel gland plates shall be provided at the top/ bottom to make holes for additional cable entry at site if required.

### **2. Final Distribution Boards shall comprise of the following:**

- 2.1 A Din Channel for mounting, where appropriate incoming supply circuit breaker & other auxiliaries for Control & distribution as required.
- 2.2 Installation accessories shall be part of the DB for fixing conductor and rails/ Din Channels for mounting MCB's and RCCB's etc. phase bus bars, neutral bus bars & earthing bus bars as required. All bus bars shall be of tinned copper. MCB's/ ELCB's shall be simply snapped fitted on to a Din Channel and screwed to the bus bar. The arrangement should be such that any MCB can be taken out of without disturbing the other MCB's.
- 2.3 Service cable/ entry connection shall be part of the Distribution Boards.
- 2.4 The board shall be installed at a height such that the operating is within reach of the normal human height i.e. 1.2 to 1.8 meters from finish floor level.
- 2.5 Degree of protection shall be **IP-52 for indoor application, IP-54 for kitchen, laundry, basements/ garages and IP-55 for outdoor application.**
- 2.6 All three phase distribution boards shall have 4 rows and single phase distribution boards shall have single rows for housing of MCB's and RCCB's unless noted otherwise.
- 2.7 Phase segregation to be maintained in all three phase distribution boards.
- 2.8 Earthing shall be provided in each FDB's.
- 2.9 Where in 3 Phase FDB's, if each phase is controlled by a DP ELCB/ DP RCCB, then a separate neutral link/ bar is to be provided per phase. These will be in addition to the main neutral link/ bar.
- 2.10 All internal wiring within the FDB shall be with flexible PVC insulated copper conductor wires of adequate size.
- 2.11 All bus bars including neutral bar/ link shall not be less than 100 Amp, 415 V.
- 2.12 Main neutral bar/ link and separate neutral link/ bar per phase shall also be of 100 Amp.
- 2.13 All connections with wires shall be with adequately sized thimbles.
- 2.14 UPS DB's will have two earth buses i.e. one for body earthing and another for third pin earthing of UPS socket. Dedicated earth bus shall be fixed on the insulated supports.

### **3. EARTHING**

Earthing shall be provided as per IS: 3043-1987.

**4 PAINTING**

All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivating (seven tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of FDB inside/ outside shall be of Siemens gray paint shade no. RAL-7032 of IS Code No.5 or as per Owner/ Architect/ PMC's requirement.

**5 LABELS**

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

**6 TESTING**

Testing of FDB's shall be as per following codes:

- a. IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.
- b. IS: 13947: 1993 for Degree of protection

**7 WIRING**

In wiring a FDB, it shall be ensured that total load of various circuits is divided evenly between the phases and number of ways as per Consultants approval.



## SUB-HEAD: G1. LT SWITCH GEAR

### 1. AIR CIRCUIT BREAKERS (ACB)

- The ACB shall conform to IEC/ IS – 60947-2. The ACB shall have a rated service short circuit breaking capacity (Ics) as specified in SLD's and BOQ "Technical parameters" at rated operational voltage (Ue) at 415V, frequency at 50 Hz. The ultimate breaking capacity (Icu) shall be equal to Service breaking capacity (Ics) and Short Ckt Withstand capacity (Ics=Icu=Icw for 1 sec) rated Impulse withstand voltage (Uimp) shall be 12kv and rated insulation voltage (Ui) at 1000V. The ACB release should have true RMS sensing. ACB should have single frame size up to 4000A and shall be suitable for "Switch Disconnect" function (AC 23 utilization category). The construction of circuit breakers shall be as per **pollution degree 3**.
- Circuit breakers shall be three/ four pole, air break, horizontal drawout/ fixed type as indicated in SLD/ BOQ.
- Drawout type Circuit breakers alongwith its operating mechanism shall be provided with suitable arrangement for easy withdrawal. Suitable guides shall be provided to minimize misalignment of the breaker.
- There shall be "SERVICE", "TEST" and "FULLY WITHDRAWN" positions for the breakers. In "TEST" position the circuit breaker shall be capable of being tested for operation without energizing the power circuits i.e. the power contacts shall be disconnected, while the control circuits shall remain undisturbed. Locking facilities shall be provided so as to prevent movement of the circuit breaker from the "SERVICE", "TEST" or "FULLY WITHDRAWN" position. Safety interlock must be provided to prevent the ACB from falling out in a fully withdrawn position. It shall be possible to close the door in "TEST" position.
- Suitable mechanical indications shall be provided on all circuit breakers to show "OPEN", "CLOSE", "SERVICE", "TEST", and "SPRING CHARGED" positions.
- All ACBs should be provided with Microprocessor based release as specified in BOQ/ SLD's should be provided on circuit breaker for short circuit, over current and earth fault protection with adjustable settings with intentional delay. Specific LED indications should be provided for short circuit, over current and earth fault operation for faster fault diagnosis and reduced down time. All ACBs should be provided with "Auto Protection" facility. Opening and closing time of ACB should be <40 m Sec and <70 m sec respectively. All Incomer ACB Release should be provided with display for current and voltage parameters (for each phase & Ground Fault). Control unit shall have fault history data & store **last 10 trip causes**.

The Circuit Breaker shall have minimum **mechanical life of 10000** operations **without maintenance**.

The electrical life of circuit breaker upto 2000 Amps shall not be less than 5000 operations and beyond 2000 Amps shall be greater than 1000 operations.

ACB releases shall be EMI/ EMC compatible. In case of Four Pole ACB, Fully rated Neutral with protection against O/L & S/C with settings at 50%-100%- OFF. ACBs should comply with RoHS. Microprocessor releases shall be provided with integral LCD Display of load current and individual loading of all the three phases. Microprocessor release shall also be suitable for zone selective interlocking (ZSI). Microprocessor releases shall also have I<sup>2</sup>t ON/ OFF time delay protection for short circuit and Earth fault.

All ACBs release shall have in-built thermal memory before and after the fault. ACB release should be provided with Rotary Dial for release setting. Separate LEDs should be provided on release itself for fault differentiation.

- Relays should be CT operated through shunt trip, under voltage trip for short circuit and earth fault protection.
- Wherever microprocessor earth fault release is asked for. Additional CT shall be provided on the neutral bus link. This CT shall have characteristics matching to the CT's installed in the ACB for the purpose. It should be possible to change the setting of release in "ON" condition.

- All circuit breakers shall be provided with "4 NO" and "4NC" potential free auxiliary contacts. These contacts shall be in addition to those required for internal mechanism of the breaker and should be directly operated from breaker operating mechanism.

- All circuit breakers shall be provided with the following interlocks :

- Movement of a circuit breaker between "SERVICE" and "TEST" position shall not be possible unless it is in open position. Attempted withdrawal of a closed circuit breaker shall preferably not trip the circuit breaker. In cases the offered circuit breaker trips on attempted withdrawal as a standard interlock, it shall be ensured that sufficient contact exist between the fixed and drawout contact at the time of breaker trip, so that no arcing takes place even with the breaker carrying it's full rated current.
- Closing of a circuit breaker shall not be possible unless it is in "SERVICE" position, "TEST" position or in "FULLY WITHDRAWN" position.

All ACB's shall have **door interlock**

- Circuit-breaker cubicles shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage, to cover the stationary isolated contacts when the breaker is withdrawn. It shall however be possible to open the shutters intentionally against pressure for testing purposes.

ACBs shall be provided with a flexibility to rotate power terminals by 90 degree to suite stringent site requirements.

- A breaker of particular rating shall be prevented from insertion in a cubicle of a different rating.
- There should be a provision of positive earth connection between fixed and moving portion of the ACB either through connector plug or sliding solid earth mechanism. Earthing bolts must be provided on the cradle or body of fixed ACB.
- It should be possible to bolt the drawout frame not only in CONNECTED position but also in TEST and DISCONNECTED position to prevent dislocation due to vibration and shocks.
- Circuit breakers shall provide with castle key/ electrical interlocking devices, as specified in "Bill Of Quantity".
- Mechanical tripping shall be possible by means of front mounted Red "trip" push-button. In case of electrically operated breakers these push buttons shall be shrouded to prevent accidental operation.

The **racking handle shall be stored on the air circuit breaker** in such a manner as to be accessible without defeating the door interlocking.

- Alternatively Means shall be provided to slowly close the circuit breaker in "withdrawn position", if required, for inspection and setting of contacts. In "service position" slow closing shall not be possible.
- All accessories like shunt release, undervoltage, motorized mechanism etc. shall be front mounted, requiring no adjustments and can be fitted at site.
- The manufacturer shall provide details of opening time and duration with temperature to ensure discrimination and proper selection for feeder protections. All ACB's of 4000A and above shall be a single ACB unit. The manufacturer shall also indicate the mechanical and electrical life of circuit breaker.
- Circuit breaker shall be provided with either of the following mechanisms as specified in "Bill Of Quantity".

The trip unit shall have following protection settings, based on the type of trip unit.

- > Adjustable over load current (Ir) settings from 40% to 100% of rating of ACB (In).



- > Over load time setting (tr) from 0.5s, 1s, 2s, 4s.....24s as field selectable curves
- > Short circuit setting (I<sub>sd</sub>) from 1.5 to 10 times of I<sub>r</sub> setting
- > Short circuit time delay adjustable from 0 to 400 msec.
- > Instantaneous (I<sub>i</sub>) protection with an adjustable pick-up and an OFF position.
- > Earth fault setting adjustable in absolute Ampere with time delay settings from 0 to 400 ms.

#### 1.01 Manually Operated Mechanism

- Manually operated mechanism shall be of manual spring charging stored energy type.
- The circuit breaker shall have a spring charging handle and push-button for closing the breaker mechanically after the spring has been charged. However, closing by spring charging handle after the spring has been fully charged shall also be acceptable, provided the movement of contacts does not take place with the movement of handle and the contacts operate only when the spring stored energy is released. Overcharging of spring shall not be possible.
- The closing action of the circuit breaker shall charge the tripping spring, thus making it ready for tripping.
- The circuit breaker shall be provided with the interlocks so that it shall not close unless the spring is fully charged.
- The mechanism shall be suitable for addition of motor mechanism at site if required for future upgrade without the need of any special accessories.

#### 1.02 Power Operated Mechanism

- Power operated mechanism shall be provided with a universal motor suitable for operation on 240 AC/ DC Control supply, with voltage variation from 90% to 110% rated voltage. Motor insulation shall be class "E" or better.

All ACBs should be provided with "Ready to Close" Contact

- The motor shall be such that it requires not more than 30 seconds for fully charging the closing spring at minimum available control voltage.
- Once the closing springs are discharged, after one closing operation of circuit breaker, it shall automatically initiate recharging of the spring.
- The mechanism shall be such that as long as power is available to the motor, a continuous sequence of closing and opening operation shall be possible. After failure of power supply at least one open-close-open operation shall be possible.
- Provision shall be made for emergency manual charging and as soon as this manual charging handle is coupled, the motor shall automatically get mechanically decoupled.
- All circuit breakers shall be provided with closing and trip coils (Shunt release + Under voltage release). The closing coil shall operate correctly at all values of voltage between 85% to 110% of rated control voltage. The trip coil shall operate satisfactorily at all values of voltage between 70% to 110% of rated control voltage and shall have continuous rating.
- Provision for mechanical closing of the breaker only in "TEST" and "WITHDRAWN" positions shall be made. Alternately, the mechanical closing facility shall be normally made inaccessible; accessibility being rendered only after deliberate removal of shrouds.

#### 2.00 Moulded Case Circuit Breakers (MCCB's)

- The Moulded case circuit Breaker (MCCB) shall conform to the latest IEC 60947-2 and IEC 947-3-1989. MCCB's shall be suitable for rated operation voltage upto 415 VAC & rated insulation voltage upto 690 VAC.

- MCCB's in AC circuits shall be of triple pole/ four pole construction as per enclosed BOQ. Operating mechanism shall be quick-make, quick-break and trip-free type (Roto-Active design). The "ON", "OFF" and "TRIP" positions of the MCCB's shall be clearly indicated and visible to the operator when mounted as in service. **Front of door operating handle shall be provided with pad lock and door interlock.** Front of door operating handle shall be provided with door interlock defeat mechanism to facilitate inspection of the MCCB during 'ON' position. MCCB shall be suitable for Positive isolation/ disconnection according to IEC 60947-1 & 2 for optimum user safety.
- The Service short circuit Breaking capacity (Ics at 415 VAC) of all MCCB's shall be as specified in SLD/ BOQ and shall have (Ics=Icu=100%).

All MCCB should have "Class-II" front facia as per IEC 60664.

Electrical life of MCCB's shall not be less than 10000 operations and mechanical life shall not be less than 20000 operations.

- The MCCB shall be current limiting type. MCCB shall have Arc extinguishing device contained in a compact, high strength, heat resistance, flame retardant, halogen free insulating moulded case with high withstand capability against thermal and mechanical stresses.
- MCCB's shall be either with Thermal-magnetic releases for over load and short circuit or with microprocessor based releases for over load and short circuit as asked for in the BOQ.

**Incase MCCB with Thermal-magnetic releases asked for in the BOQ, shall be provided earth fault module for earth fault protection.**

Load indication LED shall be integral part of electronic releases. All electronic releases shall be EMI/ EMC compatible.

- Wherever microprocessor earth fault add on earth fault Module is asked for, additional CBCT shall be provided.

It should not be possible to bypass/ switch off the S/C, E/F protection in MCCB. The E/F setting should be provided with 10% to 60% with time delay of 0.3 to 3 seconds. LED Indication should be provided in case of earth Fault. **E/F Module should have Test Push Button for self-diagnostic features without tripping the ckt breaker. Also Over current and earth fault differentiation should be provided.**

- The trip command of releases in MCCB shall over ride all the other commands. The MCCB shall employ maintenance free double break contact system to minimize the set through energies and capable of achieving Total Discrimination up to the full short circuit capacity of the downstream MCCB. The MCCB shall not be restricted to line/ load connections. MCCB shall be provided with test trip Push Button to check the proper function of tripping mechanism. MCCB shall comply with RoHS & WEEE norms
- Where Earth fault protection are indicated in drawings/ BOQ they shall be thru Add on Module MCCB's and have adjustability from 10% to 60% of rated current with adjustable time delays to aid discrimination on earth faults. The system shall be immunized against nuisance tripping as per IEC 61000-4 standards.
- MCCB's shall be capable of withstanding the thermal stresses caused by overloads and locked rotor currents of values associated with protective relay settings of the motor starting equipment and the mechanical stress caused by the peak short-circuit current of value associated with the switchgear rating. The maximum tripping time under short circuit shall not exceed 8 milliseconds.
- MCCB terminals shall be shrouded and designed to receive Bus Bar Links/ cable lugs for cable sizes relevant to circuit ratings.

- The MCCB shall have common field fittable snap-on auxiliaries common for entire range. The remote tripping coil should be of continuous duty cycle.
- Where mechanical interlocking is called-for between two Incomer and Bus Coupler or between two Incomers without Bus Couplers, proper arrangement for built-in Ronis/ Coded key interlocking shall be provided.

### 3. **MOTOR PROTECTION CIRCUIT BREAKER (MPCB)**

Motor circuit breakers shall conform to the general recommendations of standard IEC 947 -1,2 and 4 (VDE 660, 0113 NF EN 60 947-1-2-4, BS 4752) and to standards UL 508 and CSA C22-2 N°14. The devices shall be in utilization category A, conforming to IEC 947-2 and AC3 conforming to IEC 947-4. MPCB shall have a rated operational and insulation voltage of 690V AC (50 Hz) and MPCB shall be suitable for isolation conforming to standard IEC 60947-2 and shall have a rated impulse withstand voltage (Uimp) of 6 kV. The motor circuit breakers shall be designed to be mounted vertically or horizontally without derating. Power supply shall be from the top or from the bottom. In order to ensure maximum safety, the contacts shall be isolated from other functions such as the operating mechanism, casing, releases, auxiliaries, etc, by high performance thermoplastic chambers. The operating mechanism of the motor circuit breakers must have snap action opening and closing with free tripping of the control devices. All the poles shall close, open, and trip simultaneously. The motor circuit breakers shall accept a padlocking device in the "isolated" position.

The motor circuit breakers shall be equipped with a "PUSH TO TRIP" device on the front enabling the correct operation of the mechanism and poles opening to be checked. The auxiliary contacts shall be front or side mounting, and both arrangements shall be possible. The front-mounting attachments shall not change the breaker surface area. Depending on its mounting direction the single pole contact block could be NO or NC. All the electrical auxiliaries and accessories shall be equipped with terminal blocks and shall be plug-in type. The motor circuit breakers shall have a combination with the downstream contactor enabling the provision of a perfectly co-ordinated motor-starter. This combination shall enable type 1 or type 2 co-ordination of the protective devices conforming to IEC 60947-4-1. Type 2 co-ordination shall be guaranteed by tables tested and certified by an official laboratory: LOVAG (or other official laboratory). The motor circuit breakers, depending on the type, could be equipped with a door-mounted operator which shall allow the device setting. The motor circuit breakers shall be equipped with releases comprising a thermal element assuring overload protection and a magnetic element for short-circuit protection. In order to ensure safety and avoid unwanted tripping, the magnetic trip threshold (fixed) shall be factory set to an average value of 12 Ir.

All the elements of the motor circuit breakers shall be designated to enable operation at an ambient temperature of 60°C without derating. The thermal trips shall be adjustable on the front by a rotary selector. The adjustment of the protection shall be simultaneous for all poles. Phase unbalance and phase loss detection shall be available. Temperature compensation (-20°C to +60°C).

### 4. **MINIATURE CIRCUIT BREAKER (MCB)**

- Miniature Circuit Breaker shall comply with IS 8828 – 1996/ IEC 898 – 1995.
- Miniature Circuit Breaker shall be quick make and break type for 230/ 415 V AC and 50 Hz application. The housing of MCB's shall be heat resistant and having a high impact strength. The breaking current of MCB's shall not be less than 10000 Amps, at 230 V/ 415 V. The MCB's shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical 'ON' and 'OFF' indications. MCB's shall be suitable for isolation function and line load reversibility.
- MCB's shall be current limiting type class – 3. MCB's shall be classified as B, C, and D as per standard Ref. IS as per the Tripping characteristics curves defined by all the manufactures. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/ IEC and the manufactures shall publish the value.
- MCB's shall be calibrated at an ambient temperature of 40 degree.
- The MCB contacts shall be silver nickel alloy and contact tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic coil releases for short circuit protection and thermal release for over load protection.

The over load or short circuit devices shall have a common trip bar in the case of DP, TP, TPN and FP Miniature Circuit Breakers and shall have 20000 electrical operations upto 63A. The terminals shall be protected against finger contact to IP 20 Degree of protection.

- MCB's shall have a facility to accommodate accessories like auxiliary contacts, trip alarm contact, shunt trip and under voltage add-on blocks.

Use of MCB's shall be application based i.e.:

|   |   |                          |
|---|---|--------------------------|
| For computers/ IT equipment/ Servers            | : | Type 'D' characteristics |
| For motors, inductive loads and Discharge Lamps | : | Type 'C' characteristics |
| For lighting & small power                      | : | Type 'B' characteristics |

## 5. RESIDUAL CURRENT CIRCUIT BREAKER CURRENT OPERATED TYPE (RCCB)

- The RCCB/ ELCB should comply with IEC 1008 and shall be suitable for use with pure AC/AC with DC off set, for frequency range of 50 Hz to 400 Hz. The RCCB/ ELCB shall be protected against nuisance tripping by a protective device, limiting such tripping to a peak value of 250 A according to the 8/20 wave for instantaneous devices. RCCB's/ ELCB's shall be suitable for isolation function and line load reversibility.

- EL + MCB/ RCCB shall have Earth leakage, over load and short circuit protection where as ELCB shall have Earth leakage protection only. RCBO/ RCCB wherever provided in Computer systems/ IT equipment's shall be super immunized/ equivalent.

- EL + MCB/ RCCB/ ELCB shall be quick make and break type. The housing shall be heat insulated and having high impact strength. The moving contacts of the Phases shall be mounted on a common bridge, actuated by a rugged toggle mechanism for closing/ opening of all the three phases simultaneously. The neutral moving contact shall be so mounted on the common bridge that at the time of closing, the neutral makes contact first before the phases and at the time of opening, the neutral breaks last after allowing the phases to open first.

- The core balance transformer ensures positive detection of earth leakage currents. The incoming current shall pass through the toroidal core transformer. As long as the current in the phase and the neutral shall be the same, no electromotive force shall be generated in the secondary winding of the transformer. In the event of a leakage to earth, an unbalance shall be created which will cause a current to be generated in the secondary winding, this current shall be fed to a highly sensitive relay, which shall trip the circuit if the earth leakage current exceeds a predetermined critical value. The device shall be current operated independent of the line voltage, current sensitivity of 30mA/ 100mA/ 300mA at 240/ 415V AC as called for in the BOQ.

- EL + MCB/ RCCB/ ELCB shall have trip free nature of mechanism ensuring that it cannot be closed when an earth leakage fault persists.

- Test device shall be there to check the integrity of earth leakage detection system and the tripping mechanism. It shall have box type terminals and capture screws ensuring easy connection of cables and protected against finger contact to IP 20 Degree of Protection.

## 6. METERS

- a. All voltmeters/ multi-function meters and indicating lamps shall be protected through MCB's/ MPCB's depending upon fault level.
- b. Meters and indicating instruments shall be flush type.
- c. All CT's connection for meters shall be through Test Terminal Block (TTB).
- d. CT ratio and burdens shall be as specified on the Single line diagram/ in the BOQ/ as required for the application.

## 7. CURRENT TRANSFORMERS

Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondary's for operation of associated metering.

The CTs shall conform to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary

terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 and metering CTs shall be of accuracy class I.

Accuracy class and VA burden shall be as per the application as required as per metering/ protection needs.

**8. INDICATING PANEL**

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted digital type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/ MPCB as per required fault level. Indicating Lamps shall be of LED type. All digital instruments shall have shrouded terminals and suitable for 0°C to 50°C temperature range and shall withstand 1.2 time over loading. Accuracy class and VA burdens shall be as per the requirement. Meters shall be with RS 485 port wherever called for in the BOQ's.

**9. SELECTOR SWITCH**

Where called for selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode.

**10. CONTACTOR**

Contactor shall be built into a high strength thermoplastic body and shall be provided with a shield for quick arc extinguishing. Silver alloy tips shall be provided to ensure a high degree of reliability and endurance under continuous operation. The magnet system shall consist of laminated yoke and armature to ensure clean operation without hum or chatter.

Starter's contactors shall have 3 main and 2 Nos. NO/ NC auxiliary contacts and shall be air break type suitable for making and breaking contact at minimum power factor of 0.35. For design consideration of contactors the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of Star Delta Starters. The insulation for contactor coils shall be of Class "E".

Coil shall be tape wound vacuum impregnated and shall be housed in a thermostatic bobbin, suitable for tropical conditions and shall withstand voltage fluctuations. Coil shall be suitable for 240/ 415 + 10% volts, 50 cycles AC supply. Contactors shall be of 3P/ 4P design as required.

**11. THERMAL OVERLOAD RELAY**

Thermal overload relay shall have built in phase failure sensitive tripping mechanism to prevent against single phasing. The relay shall operate on the differential system of protection to safeguard against three phase overload, single phasing and unbalanced voltage conditions.

Auto-manual conversion facility shall be provided to convert from auto-reset mode to manual reset mode and vice-versa at site. Ambient temperature compensation shall be provided for variation in ambient temperature from -5deg C + 55 deg C.

All overload relays shall be of three element, positive acting ambient temperature compensated time logged thermal over load relays with adjustable setting. Relays shall be directly connected for motors upto 35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacities.

**12. TIME DELAY RELAYS**

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one set of auxiliary contacts for indicating lamp connection.

**13. TOGGLE SWITCH**

Toggle switches, where called for in Schedule of Quantities, shall be in conformity with relevant IS codes and shall be of 5 amps rating.

**14. PUSH BUTTON STATIONS**

Push button shall be provided for manual starting and stopping of motors/ equipment "Green" and "Red" colour push buttons shall be provided for 'Starting' and 'Stopping' operations. 'Start' or 'Stop' indicating flaps shall be provided for push buttons. Push buttons shall be suitable for panel mounting and accessible from front without opening door, Lock lever shall be provided for 'Stop' push buttons. The push button contacts shall be suitable for 6 amps current capacity.

**15. Coordination Study In LV Network**

LV Switchgear Manufacturer shall submit coordinated & Discriminated solution for LV Network protection devices i.e. **ACB, MCCB, MPCB & MCB** for all Incoming and outgoing devices for all Panels/ DB's as per BOQ with the help of published discrimination tables. Total discrimination shall be provided up to the short circuit breaking capacity of downstream circuit Breakers.

**16. CAPACITORS:**

**16.1 Power Factor Improvement Capacitors:**

- The power factor improvement capacitors shall be either heavy duty Dry type MPP (metalized polypropylene type) or Dry type gas filled type (inert gas) as asked for in the BOQ.
- The MPP type capacitors shall be made with impregnation technology. The capacitor shall be made using three capacitor elements wound wired internally in a delta connection with PPMh and positioned inside a metal case. Impregnation shall be Dry resin filled or Gas filled.
- The capacitors shall be meant for continuous duty.
- The operating voltage of capacitors shall be 525V for harmonics environment, where non linear IT loads, VFD's UPS & other similar loads are present.
- The operating voltage of normal application shall be 450V.
- Dielectric losses shall less than or equal to 0.2W/ Watt/ KVAR.
- Capacitance tolerance shall be within the range of – 5 to + 10%.
- The rated frequency shall be 50 Hz  $\pm 3\%$ .
- Life expectancy shall be equal to or more than 170000 hours.
- The reference standard for capacitors shall be IEC 831-1/2.
- Capacitors should have high over load capabilities with good thermal & mechanical protections.

**16.2 Harmonic circuit filter reactors 7% & 14%:**

- Harmonic circuit filters shall be single layer strip wound type construction.
- These shall be designed for low loss. Its design shall be step core type for lower losses.
- It shall be vacuum impregnated.
- The class of insulation shall be H class, 180 deg C.
- The reactors are made out of an iron core and air gap.
- It shall have low temperature rise & lower flux density so that it operate in worst conditions of ambient & harmonic loads.
- These should offer good degree of linearity and low losses.
- The filter reactors shall have filtering factor of 7% and 14% as called for in the BOQ.
- These filters are designed for protection of capacitors against Harmonics.

**16.3 Automatic power factor correction relay:**

- The relay shall be an intelligent relay which should measure, monitor and control reactive energy.

- It shall automatically monitor the power factor, monitor all the connected capacitor steps with real time power in KVAR.
- The relay shall be communicable with RS 485 modbus protocol.

#### **17. MOTOR STARTERS AND DRIVES WITH IN MCC's/ WITH IN PANELS**

##### **Type of Motor Starters:**

- DOL starters upto 10HP/ 7.5 KW motors.
- Star-Delta starters from 12.5HP/ 9.3 KW onwards.
- Soft starters/ VFD's for main fire pumps.
- VFD's for motors, wherever specified.

##### **DOL Starters for motors upto 5HP/ 3.7 KW shall have:**

- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt O/L & S/C releases and with SPP feature. O/L relay shall be adjustable type.
- Suitable rated 3P contactor with 2NO + 2NC auxiliary contacts.
- 2 Pole/ 2 Way Auto/ Manual selector switch.
- ON/OFF push buttons.
- ON/ OFF/ Trip LED indications (110V)
- 1 No. cast resin metering Class-1 accuracy CT of adequate burden & ratio in one of the phases
- Digital Ammeter.

##### **DOL Starters for motors above 5HP/ 3.7 KW & upto 10HP/ 7.5 KW shall have:**

- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt O/L & S/C releases and with SPP feature. O/L relay shall be adjustable type.
- Suitable rated 3P contactor with 2NO + 2NC auxiliary contacts.
- 2 Pole/ 2 Way Auto/ Manual selector switch.
- ON/ OFF push buttons.
- ON/ OFF/ Trip LED indications (110V).
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio, one in each phase.
- Digital Ammeter.

##### **Star-Delta Starter from 12.5HP/ 9.3 KW to 30HP/ 22 KW shall have:**

- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt S/C release.
- Suitable rated 3P Star, Delta & Run contactors with 2NO + 2NC auxiliary contacts.
- Star-Delta Timer
- Electronic O/L protection relay with inbuilt current sensing SPP and with trip contact.
- 2 Pole/ 2 Way Auto/ Manual selector switch.
- ON/ OFF push buttons.
- ON/ OFF/ Trip LED indications (110V)
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio ,one in each phase.
- Digital Ammeter

##### **Star-Delta Starter from 40HP/ 30 KW & Above shall have:**

- Type-II Co-ordination
- Suitable rated 3P Motor Duty MCCB of required fault withstand capacity with inbuilt thermal-magnetic S/C release.
- Suitable rated 3P Star, Delta & Run contactors with 2NO + 2NC auxiliary contacts.
- Star-Delta Timer
- Electronic O/L protection relay with inbuilt current sensing SPP and with trip contact.

- 2 Pole/ 2 Way Auto/ Manual selector switch.
- ON/ OFF push buttons.
- ON/ OFF/ Trip LED indications (110V)
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio, one in each phase.
- Digital Ammeter

**VFD Starter for motors upto 30HP/ 22 KW shall have:**

- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt S/C release.
- Suitable rated IP20 VFD (Inside Panel).

**VFD Starter for motors 40HP/ 30KW & Above shall have:**

- Suitable rated 3P motor duty MCCB of required fault withstand capacity with inbuilt thermal-magnetic S/C release.
- Suitable rated IP20 VFD (Inside Panel).

**Following motor control centres/ panels shall have:**

- 3 Pole incomer switch i.e. MCCB or ACB & 3P bus bars
  - a. AHU Panel
  - b. Basement ventilation panel
  - c. Staircase & lift well pressurization fan panel
  - d. Smoke venting panel
  - e. Chillers auxiliary panel
  - f. Chiller plant panel
  - g. Plumbing panel
  - h. Fire pump panel
  - i. Sump pump panel
  - j. DG set auxiliary panel

**VFD with bypass DOL Starter:**

- All items as listed above suitable for motor rating as specified above along with VFD & change over scheme between VFD & starter. VFD shall be IP20.

**VFD with bypass Star Delta Starter:**

- All items as listed above suitable for motor rating as specified above along with VFD & change over scheme between VFD & starter. VFD shall be IP20.

**18. MOTOR STARTERS AND DRIVES IN STANDALONE INSIDE AHU ROOMS ETC. NEAR MOTORS**

**Note: Only 3 Phase supply without neutral shall be available at starter incomer/ VFD disconnect switch.**

**Type of Motor Starters:**

- DOL starters upto 10HP/ 7.5 KW motors.
- Star-Delta starters from 12.5HP/ 9.3 KW onwards.
- Soft starters/ VFD's for main fire pumps.
- VFD's for motors, wherever specified.

**DOL Starters for motors upto 5HP/ 3.7 KW shall have:**

- 14G CRCA powder coated sheet steel enclosure, wall mount type to house switchgear.
- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt O/L & S/C releases and with SPP feature. O/L relay shall be adjustable type.
- Suitable rated 3P contactor with 2NO + 2NC auxiliary contacts.
- 2 Pole/ 2 Way Auto/ Manual selector switch.
- ON/ OFF push buttons.
- ON/ OFF/ Trip LED indications (110V)



- 3 Nos. cast resin metering Class-1 accuracy CT of adequate burden & ratio , one in each phase
- Digital KWH meter + Ammeter - communicable type.
- Metering PT:
  - ✓ 415V/  $\sqrt{3}$ / 110V /  $\sqrt{3}$  PT for metering and indication lamps.
  - ✓ PT shall be Class-1 accuracy.
  - ✓ PT shall be cast resin type.
  - ✓ PT shall be of suitable burden (VA).
- Protection for metering PT:
  - ✓ TP MPCB /TP MCB of suitable rating & fault withstand capacity on primary side of PT.
  - ✓ TP MCB of suitable rating on secondary side of PT.

**DOL Starters for motors above 5HP/ 3.7 KW & upto 10HP/ 7.5 KW shall have:**

- 14G CRCA powder coated sheet steel enclosure, wall mount type to house switchgear.
- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt O/L & S/C releases and with SPP feature. O/L relay shall be adjustable type.
- Suitable rated 3P contactor with 2NO + 2NC auxiliary contacts.
- 2 Pole / 2 Way Auto / Manual selector switch.
- ON/OFF push buttons.
- ON/OFF/Trip LED indications (110V).
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio,one in each phase.
- Metering PT:
  - ✓ 415V /  $\sqrt{3}$  / 110V /  $\sqrt{3}$  PT for metering and indication lamps.
  - ✓ PT shall be Class-1 accuracy.
  - ✓ PT shall be cast resin type.
  - ✓ PT shall be of suitable burden (VA).
- Protection for metering PT:
  - ✓ TP MPCB /TP MCB of suitable rating & fault withstand capacity on primary side of PT.
  - ✓ TP MCB of suitable rating on secondary side of PT.

**Star-Delta Starter from 12.5HP / 9.3 KW to 30HP / 22 KW shall have:**

- 14G CRCA powder coated sheet steel enclosure, wall mount type to house switchgear.
- Type-II Co-ordination
- Suitable rated 3P MPCB of required fault withstand capacity with inbuilt S/C release.
- Suitable rated 3P Star, Delta & Run contactors with 2NO + 2NC auxiliary contacts.
- Star-Delta Timer
- Electronic O/L protection relay with inbuilt current sensing SPP and with trip contact.
- 2 Pole / 2 Way Auto / Manual selector switch.
- ON/OFF push buttons.
- ON/OFF/Trip LED indications (110V)
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio, one in each phase.
- Metering PT:
  - ✓ 415V /  $\sqrt{3}$  / 110V /  $\sqrt{3}$  PT for metering and indication lamps.
  - ✓ PT shall be Class-1 accuracy.
  - ✓ PT shall be cast resin type.
  - ✓ PT shall be of suitable burden (VA).
- Protection for metering PT:
  - ✓ TP MPCB of suitable rating & fault withstand capacity on primary side of PT.
  - ✓ TP MCB of suitable rating on secondary side of PT.

**Star-Delta Starter from 40HP / 30 KW & Above shall have:**

- 14G CRCA powder coated sheet steel enclosure, wall mount type to house switchgear.
- Type-II Co-ordination

- Suitable rated 3P Motor Duty MCCB of required fault withstand capacity with inbuilt thermal-magnetic S/C release.
- Suitable rated 3P Star, Delta & Run contactors with 2NO + 2NC auxiliary contacts.
- Star-Delta Timer
- Electronic O/L protection relay with inbuilt current sensing SPP and with trip contact.
- 2 Pole / 2 Way Auto / Manual selector switch.
- ON/OFF push buttons.
- ON/OFF/Trip LED indications (110V)
- 3 Nos. cast resin metering Class-1 accuracy CT's of adequate burden & ratio, one in each phase.
- Metering PT:
  - ✓ 415V /  $\sqrt{3}$  / 110V /  $\sqrt{3}$  PT for metering and indication lamps.
  - ✓ PT shall be Class-1 accuracy.
  - ✓ PT shall be cast resin type.
  - ✓ PT shall be of suitable burden (VA).
- Protection for metering PT:
  - ✓ TP MPCB of suitable rating & fault withstand capacity on primary side of PT.
  - ✓ TP MCB of suitable rating on secondary side of PT.

**VFD Starter for motors upto 30HP / 22 KW shall have:**

- Suitable rated 3P disconnect switch.
- Suitable rated IP56 VFD.

**VFD Starter for motors 40HP / 30KW & Above shall have:**

- Suitable rated 3P disconnect switch.
- Suitable rated IP56 VFD.

**Following motor control centres / panels shall have:**

- 3 Pole incomer switch i.e. MCCB or ACB & 3P bus bars
  - a. AHU Panel
  - b. Basement ventilation panel
  - c. Staircase & lift well pressurization fan panel
  - d. Smoke venting panel
  - e. Chillers auxiliary panel
  - f. Chiller plant panel
  - g. Plumbing panel
  - h. Fire pump panel
  - i. Sump pump panel
  - j. DG set auxiliary panel

**VFD with bypass DOL Starter:**

- All items as listed above suitable for motor rating as specified above along with VFD & change over scheme between VFD & starter. VFD shall be IP20.

**VFD with bypass Star Delta Starter:**

- All items as listed above suitable for motor rating as specified above along with VFD & change over scheme between VFD & starter. VFD shall be IP20.

## **SUB-HEAD: G2. TYPE TESTED ASSEMBLY PANEL (TTA)**

### **1. SCOPE OF WORK**

The vendor scope shall be design, manufacturing, supply, supervision for testing and commissioning of L.T. Panels as per IEC 61439-1&2 for Power & Motor Control Center of Voltages up to 1000 V.

The vendor shall furnish the materials, labour, tools and equipment for installation work, as shown in the accompanying drawings, bill of quantities and specifications hereinafter described.

The drawings, specifications and bill of quantities shall be considered as a part of this scope of work and any work or materials shown on the drawings and not called for in the specifications or vice-versa, shall be considered as if specifically called for in both.

The vendor shall submit the completed data sheet, dimensional drawings and catalogues of switchgears and related brought out items etc. along with quote and detailed general arrangement drawings of the panel within 10 days of signing of the contract for Client/ Consultant's approval.

The GA drawings shall also show all setting out details and physical data/ dimensions of all components used in the system, etc.

### **2. L.T. SWITCHBOARDS**

#### **2.1 General**

- The LV switchboards shall be **as per the standards IEC 61439-1&2**. The switchboards and the associated equipment including switchgear, control gear, Busbar supports, Busbar orientation, Busbar links etc shall be identical in construction to the assembly which has undergone the type test. The drawings of the type-tested assemblies shall be made available for inspection. Panel Manufacturer must have an established track record in Design, Manufacturing and Supply of IEC certified Assemblies for at least 10-12 Years.
- The designs of the switchboards should be with switchgear manufacturer, and all the mechanical drawings must be available in the factory beforehand.
- Switchboards shall have a short circuit level withstand as per Schedule of Quantities and drawings.
- The enclosures shall be designed to take care of normal stress as well as abnormal electro-mechanical stress due to short circuit conditions. All covers and doors provided shall offer adequate safety to operating persons and provide ingress protection of IP 4X/ 52 unless otherwise stated. Ventilating openings and vent outlets, if provided, shall be arranged such that same ingress protection of IP 4X/52 is retained. Suitable pressure relief devices shall be provided to minimize danger to operator during internal fault conditions. The compartmentalization to be achieved by using metal separators, use of PVC sheet/ Hylem sheets shall not be allowed.
- Switchboard shall be Internal Arc complied to Internal Arc Resistance as per IEC-61641-V2 rated at 65KA for 0.4 Sec.
- The switchboard along with ACBs and connections should have been be type tested design at CPRI/ Independent international test house for short circuit, temperature rise, protective earth short circuit test and dielectric tests of the ratings required.

#### **2.2 Switchboard Configuration**

- The Switchboard shall be configured with Air Circuit Breakers, MCCB's, MCB's and other equipment as called for in the schedule of quantities.
- The MCCBs shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance. In case of

double tier ACB arrangement, maximum current rating of vertical dropper shall not exceed 2500A in any case.

- The Switchboards shall be of adequate size with a provision of spare space to accommodate possible future additional switch gear.
- The Switchboard shall be tested for Impulse withstand test at 12KV for all the Panels.
- OEM & Partner's name should be mentioned on Top of each all columns of switchboard.

### **2.3 Constructional Features**

- The Switchboards shall be metal clad totally enclosed, floor mounted free standing type of modular extensible design suitable for indoor mounting.
- Switchboards construction shall employ the principle of compartmentalized and segregation for each circuit.
- Incomer and bus section panels or sections shall be separate and independent and shall not be wired with sections required for feeder. The incomer panel shall be suitable for receiving bus trunking or MV cable of size specified.
- Switchboards shall be made up of requisite vertical sections, which when coupled together, shall form continuous dead front switchboards.
- Switchboard shall be readily extensible on both sides by addition of vertical sections after removal of the end covers.
- The switchboards shall be designed for use in high ambient temperature and humid tropical conditions as specified. Ease of inspections, cleaning and repairs while maintaining continuity of operation shall be provided in the design.
- Metal based neoprene gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 42/IP 54 as stipulated in schedule of quantities. The unused openings within the switchboards shall be closed using suitable grommets.
- Each vertical section shall be provided with a rear or side cable chamber housing the cable end connections and power/ control cable terminations. There should be generous availability of space for ease of installation and maintenance with adequate safety for working in one vertical section without coming into contact with any live parts. The design of the switchboard shall allow standard extension chambers if required to accommodate cables.
- Switchboard panels and cubicles shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be fabricated from CRCA sheet steel of thickness not less than 2 mm. Mounting Plates and internal partition shall be fabricated from Aluzinc sheet of 1.6/2.0mm. Joints of any kind in sheet metal shall be Bolted type. Aluzinc and CRCA sheet shall be tested for Damp Heat and Salt Mist for Aging and Corrosion Resistance of Paint Surface and Metal.
- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
- Switchboard shall be provided with "Danger Notice Plate" conforming to relevant Indian Standards.

### **2.4 Switchboard Dimensional Limitations**

- The overall height of the switchboard shall be limited to 2400 mm for all the Busbar ratings and type of switchboards. Panel should have integral base frame of 75mm, hence total panel height should not be more than 2275mm.

- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 2000 mm from finished floor level.
- Other dimensional limits if any are specified separately.

## 2.5 Switchboard Compartmentalization

- For compartmentalized switchboards, separate totally enclosed compartments shall be provided for horizontal busbars, vertical busbars, ACBs, MCCBs, and cable alloys.
- The main board shall be with Form 4b Construction with metallic shrouding only, FRP is not acceptable. Enclosure shall be roughed enough to bear the Seismic Resonance of level Zone-IV. Type test certificate to be submitted for a similar prototype assembly.
- Earthed metal or insulated shutters shall be provided between drawout and fixed portion of the switchgear such that no live parts are accessible with equipment drawn out. Degree of protection within compartments shall be at least IP 2X.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker in "ON" and "OFF" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control MCB etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
- For Some MCCB feeders for critical loads like UPS it may be required to have operation only after opening the door, all other facilities like pad lockable rotary handle to be provided for such feeder. It shall be possible to do this change during execution of order
- Each switchgear cubicles shall be fitted with label in front and back identifying the circuit, switchgear type, rating and duty. All operating device shall be located in front of switchgear only. Minimum Height from floor level for any device mounted on panel cover shall be minimum 250mm.
- A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
- Separate cable compartments running the height of the switchboard in the case of front access boards shall be provided for incoming and outgoing cables.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top. The construction shall include necessary and adequate and proper support shall be provided in cable compartments to support and clamping the cable in the cable alley/ cable chamber.

## 2.6 Switchboard Bus Bars

- Busbars shall be made of high conductivity, and high strength Aluminum E91 grade Busbars shall be of rectangular cross sections suitable for full load current for phase bus bars and half/ full rated current for neutral bus bar or as stipulated in schedule of quantities. Busbar thickness shall not be more than 6mm for better heat desipation. Busbar shall be suitable to withstand the stresses of fault level as specified in schedule of quantities.
- Main Horizontal busbar and Neutral should be in same compartment.
- The bus bar system may comprise of a system of main horizontal bus bars and auxiliary vertical bus bars run in bus bar alloy on either side in which the circuit could be arranged with front access for cable entrances
- The bus bars shall be supported on non-breakable, non-hygroscopic epoxy resin or glass fiber reinforced polymer insulated supports able to withstand operating temperature of 110 Deg C at regular intervals, to withstand the forces arising from a fault level as stipulated in schedule of quantities. **The material and the spacing of the Busbar supports should be same as in integrated certificate**

**tested as per IEC61439 part-1&2 the type tested assembly. The Bus bar** insulator shall be certified for glow wire test as per IEC-61439.

- All ACB terminals shall have vertical-vertical configuration for termination of incoming & outgoing bus links. All MCCB's upto 630A shall be provided with rear stud type terminations.
- Interleaved Bus Bar arrangement shall be provided for all the panels with bus bar rating of 3200A and above. Distance between bus bar supports shall be inline with type test certificate but shall not exceed 450mm in any case.
- Auxiliary buses for control power supply, space heater power supply or any other specified service shall be provided. These buses shall be insulated, adequately supported and sized to suit specific requirement. The material for auxiliary supply bus will be insulated electrolytic copper. Wires.
- Clearances between phases should be in line with IEC.

## **2.7 Switchboard Interconnection**

- All connection and tap offs shall be through adequately sized connectors appropriate for fault level at location. This shall include tap off to feeders and instrument/control transformers.
- For unit ratings upto 100 amps, PVC insulated 105 dg withstand, copper conductor wires of adequate size to carry full load current shall be used. The terminations of such interconnections shall be crimped. Solid connections shall be used for all rating of above 100 amps.
- All connections, tappings, clamping, shall be made in an approved manner to ensure minimum contact resistance. All connections shall be firmly bolted and clamp with even tension. Before assembly joint surfaces shall be filed or finished to remove burrs, dents and oxides and silvered to maintain good continuity at all joints. All screws, bolts, washers shall be zinc plated. Only 8.8 grade nuts and bolts shall be used for busbar connections.

## **2.8 Drawout Features**

Air Circuit Breakers shall be provided in fully drawout cubicles, unless otherwise stated. These cubicles of ACB shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self-aligning and self-isolating contacts. Mechanical latches shall be integrated in ACB at service, test and isolated position to ensure that Breaker is firmly latched in respective position. It shall not be possible to move the breaker from the position unless latch is manually operated.

## **2.9 Instrument Accommodation**

- All voltmeter and ammeter and other instruments shall be flush mounted type of size 96 sq. mm conforming to class 1.5 to IS 1248 for accuracy. All voltmeter shall be protected with MPCBs.
- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switchboard.
- For MCCBs, instruments and indicating lamps can be provided on the compartment doors.
- The current transformers for metering and for protection shall be mounted on the solid copper/ aluminium busbars with proper supports.
- On all the incomers of switch boards ON/ OFF indicators lamps shall be provided suitable for operation on AC 230 volts supply. All lamps shall be protected by MCBs.
- For Incomer and important outgoing feeders comprehensive power meters shall be provided which shall display A, V, Pf, Hz, Kw, KVA, KVA<sub>r</sub>, Kwh, Kvarh, average and maximum values, demand values, THD on current and Voltages. Meter should be provided with RS485 port and should be compatible with BMS/ Scada.

## **2.10 Wiring**

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 Sqmm for Voltage circuit and 2.5 sq. mm. for Current circuit shall be neatly bunched and suitably supported and clamped. Means shall be provided for easy identification of wires. Identification ferrules shall used at both end of wires. All control wires meant for external connections are to be brought out on a terminal board. **The cables and control wires shall be suitable for withstanding 105 deg C.**

## **2.11 Ventilation Fans**

The Switchboard shall be provided with panel mounting type ventilation fans in each panel with switchgear rated for 4500 amp and above. The fan shall be interlocked with switchgear operation. The degree pf enclosure protection to be maintained even with Fans.

## **2.12 Earthing**

Continuous earth bus sized for prospective fault current to be provided with arrangement for connecting to station earth at two points. Hinged doors/ frames to be connected to earth through adequately sized flexible braids.

## **2.13 Sheet Steel Treatment and Painting**

Sheet steel used in the fabrication of switchboards shall undergo On line multi nozzle spray system for each process on the parts hanging from the slow speed conveyor leading to the oven for drying after Pre-treatment as per IS:101-1988. Effective temp and concentration control powder coated for desired shade of RAL 7035. Final paint coat of oven baked powder coating shall be of minimum 60 micron thickness. Powder coated sheet should withstand the 500Hrs of Salt Spray test as per IS: 101-1998.

## **2.14 Name Plates and Labels**

- a) One nameplate giving designation of the switchboard shall be affixed prominently on top. Details of designation shall be specified.
- b) Labels giving following details shall be affixed on each feeder panel:-
  - Feeder No - As per feeder list
  - Equipment tag Number and Description
  - Rating (KW/ KVA/ AMP)
- c) All components whether mounted inside the switchboard or on the door shall be permanently and clearly labeled with reference number and/or letter of their function. These labels should be fixed so that they are easily visible.
- d) Labels for feeder panel designation shall be fixed on the front side of respective panels with Special rivet made of nylon. These labels shall be identical size to permit interchange.

## **2.15 Type test reports**

Switchboard configurations offered shall be CPRI/ Independent international test house tested for all the tests as per IEC61439-1 and internal arc tests, impact resistance test. Copies of the test certificates shall be submitted with the tender.

## **2.16 Testing at Works**

Copies of type test carried out at ACB/ MCCB manufacturers works and routine tests carried out at the switchboard fabricators shop shall be furnished along with the delivery of the switchboards. Engineer-in-Charge reserves the right to get the switchboard inspected by their representative at fabricators works prior to dispatch to site to witness the followings.

- a) Physical variation and dimensional check
- b) Verification of bill of material
- c) Functional check
- d) HV test
- e) IR test

## **SUB-HEAD: G3. VFD SPECIFICATION**

### **1.0 SCOPE**

This specification covers the general design, materials, construction features, manufacture, shop inspection and testing at manufacturer's works, delivery at site, installation, testing, commissioning and carrying out performance test at site of Variable Frequency Drives.

### **2.0 CODES and STANDARDS**

The design, materials, construction features, manufacturer, inspection, testing and performance of variable frequency drives shall comply with all currently applicable statutes, regulations, codes and standards in the locality where the system is to be installed. Nothing in this specification shall be construed to relieve the Contractor of this responsibility. In particular, the air distribution system shall conform to the latest edition of following standards.

### **3.0 GENERAL REQUIREMENTS**

- ✓ This specification covers complete variable frequency drives (VFDs) designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD.
- ✓ The frequency converter shall not be a general purpose product, but a dedicated HVAC engineered design.
- ✓ The VFD and its options shall be factory mounted and tested as a single unit under full load before dispatch.
- ✓ The VFD shall be tested to UL 508C. The appropriate UL label shall be applied. VFD shall be manufactured in ISO 9000, 2000 certified facilities.
- ✓ The VFD shall be CE marked and conform to the European Union Electro Magnetic Compatibility directive.
- ✓ The VFD shall be UL listed for a short circuit current rating of 100 kA and labeled with this rating.
- ✓ The manufacturer shall have been engaged in the production of this type of equipment for a minimum of thirty years.
  
- ✓ The frequency converter shall be supported locally by the manufacturer who will provide full technical support, spares holding and troubleshooting capability from their own local facility. A training course shall be provided by the manufacturer to the consultant/ contractor/ maintenance engineers.
- ✓ To ensure adequate technical and factory support, VFDs manufactured by others and brand labeled shall not be acceptable.

### **4.0 TECHNICAL REQUIREMENTS**

The VFD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor derating.

When properly sized, the VFD shall allow the motor to produce full rated power at rated motor voltage, current, and speed without using the motor's service factor. VFDs utilizing sine weighted/ coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

The VFD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor derating.

When properly sized, the VFD shall allow the motor to produce full rated power at rated motor voltage, current, and speed without using the motor's service factor. VFDs utilizing sine weighted/ coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

The VFD shall include an input full-wave bridge rectifier and maintain a fundamental (displacement) power factor near unity regardless of speed or load.

The VFD shall have a dual 5% impedance DC link reactor (harmonic filters) on the positive and negative rails of the DC bus to minimize power line harmonics and protect the VFD from power line



transients. The chokes shall be non-saturating. Swinging chokes that do not provide full harmonic filtering throughout the entire load range are not acceptable.

VFDs with saturating (non-linear) DC link reactors shall require an additional 3% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.

IEEE519, 1992 recommendations shall be used for the basis of calculation of total harmonic distortion (THD) at the point of common coupling (PCC). On request VFD manufacturer shall provide THD figures for the total connected load. The contractor shall provide details of supply transformer rating, impedance, short circuit current, short circuit impedance etc to allow this calculation to be made.

All VFDs shall contain integral EMC Filters to attenuate Radio Frequency Interference conducted to the AC power line. The VFDs shall comply with the emission and immunity requirements of IEC 61800-3: 2004, Category C1 with 50m motor cable (unrestricted distribution). The suppliers of VFDs shall include additional EMC filters.

The VFD's full load output current rating shall meet or exceed the normal rated currents of standard IEC induction motors. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 120% of rated torque for up to 0.5 second while starting.

The VFD shall provide full motor torque at any selected frequency from 20 Hz to base speed while providing a variable torque V/Hz output at reduced speed. This is to allow driving direct drive fans without high speed derating or low speed excessive magnetization, as would occur if a constant torque V/Hz curve was used at reduced speeds. Breakaway current of 160% shall be available.

A programmable automatic energy optimization selection feature shall be provided as standard in the VFD. This feature shall automatically and continuously monitor the motor's speed and load to adjust the applied voltage to maximize energy savings.

The VFD must be able to produce full torque at low speed to operate direct driven fans.

Output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD.

An Automatic Motor Adaptation algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to perform the test.

Galvanic isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete digital I/O shall include additional isolation modules.

VFD shall minimize the audible motor noise through the used of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD operation while reducing motor noise. VFDs with fixed carrier frequency are not acceptable.

The VFD shall allow up to at least 100 meters of SWA (Single Wire Armour) cable to be used between the FC and the motor and allow the use of MICS (Mineral Insulated Copper Sheath) cable in the motor circuit for fire locations.

## **5.0 PROTECTIVE FEATURES**

A minimum of Class 20 I<sup>2</sup>t electronic motor overload protection for single motor applications shall be provided. Overload protection shall automatically compensate for changes in motor speed.

Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain language. Codes are not acceptable.

Protect VFD from input phase loss. The VFD should be able to protect itself from damage and indicate the phase loss condition. During an input phase loss condition, the VFD shall be able to be programmed to either trip off while displaying an alarm, issue a warning while running at reduced output capacity, or issue a warning while running at full commanded speed. This function is independent of which input power phase is lost.

Protect from under voltage. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output, without faulting, with an input voltage as low as 70% of the nominal voltage.

VFD shall include current sensors on all three output phases to accurately measure motor current, protect the VFD from output short circuits, output ground faults, and act as a motor overload. If an output phase loss is detected, the VFD will trip off and identify which of the output phases is low or lost.

If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. It shall also be possible to program the VFD so that it reduces its output current limit value if the VFD's temperature becomes too high.

In order to ensure operation during periods of overload, it must be possible to program the VFD to automatically reduce its output current to a programmed value during periods of excessive load. This allows the VFD to continue to run the load without tripping.

The VFD shall have temperature controlled cooling fan(s) for quiet operation, minimized losses, and increased fan life. At low loads or low ambient temperatures, the fan(s) may be off even when the VFD is running.

Protect from output switching: The VFD shall be fully protected from switching a contactor / isolator at the output without causing tripping e.g.: for switching on/off the isolators of the AHU / ventilation fans / pumps near the motor with VFD in ON mode.

The VFD shall store in memory the last 10 alarms. A description of the alarm, and the date and time of the alarm shall be recorded.

When used with a pumping system, the VFD shall be able to detect no-flow situations, dry pump conditions, and operation off the end of the pump curve. It shall be programmable to take appropriate protective action when one of the above situations is detected.

## **6.0 INTERFACE FEATURES**

Hand, Off and Auto keys shall be provided on the control panel to start and stop the VFD and determine the source of the speed reference. It shall be possible to either disable these keys or password protect them from undesired operation.

There shall be an "Info" key on the keypad. The Info key shall include "on-line" context sensitive assistance for programming and troubleshooting.

The VFD shall be programmable to provide a digital output signal to indicate whether the VFD is in Hand or Auto mode. This is to alert the Building Automation System whether the VFD is being controlled locally or by the Building Automation System.

Password protected keypad with alphanumeric, graphical, backlit display can be remotely mounted. Two levels of password protection shall be provided to guard against unauthorized parameter changes.

All VFDs shall have the same customer interface. The keypad and display shall be identical and interchangeable for all sizes of VFDs.

To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD's keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters. Keypad shall provide visual indication of copy status.

Display shall be programmable to communicate in multiple languages including English, Chinese, Korean, Japanese, Thai and Indonesian.

A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD. The VFD shall also have individual Fan, Pump, and Compressor menus specifically designed to facilitate start-up of these applications.

A three-feedback PID controller to control the speed of the VFD shall be standard.

This controller shall accept up to three feedback signals. It shall be programmable to compare the feedback signals to a common setpoint or to individual setpoints and to automatically select either the maximum or minimum deviating signal as the controlling signal. It shall also be possible to calculate the controlling feedback signal as the average of all feedback signals or the difference between a pair of feedback signals.

The VFD shall be able to apply individual scaling to each feedback signal.

For fan flow tracking applications, the VFD shall be able to calculate the square root of any or all individual feedback signals so that a pressure sensor can be used to measure air flow.

The VFD's PID controller shall be able to actively adjust its setpoint based on flow. This allows the VFD to compensate for a pressure feedback sensor which is located near the output of the pump rather than out in the controlled system.

The VFD shall have three additional PID controllers which can be used to control damper and valve positioners in the system and to provide setpoint reset.

Floating point control interface shall be provided to increase/ decrease speed in response to contact closures.

Five simultaneous meter displays shall be available. They shall be selectable from (at a minimum), frequency, motor current, motor voltage, VFD output power, VFD output energy, VFD temperature in degrees, feedback signals in their own units, among others.

Programmable Sleep Mode shall be able to stop the VFD. When its output frequency drops below set "sleep" level for a specified time, when an external contact commands that the VFD go into Sleep Mode, or when the VFD detects a no-flow situation, the VFD may be programmed to stop. When the VFD's speed is being controlled by its PID controller, it shall be possible to program a "wake-up" feedback value that will cause the VFD to start. To avoid excessive starting and stopping of the driven equipment, it shall be possible to program a minimum run time before sleep mode can be initiated and a minimum sleep time for the VFD.

A run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of initiating an output "run request" signal to indicate to the external equipment that the VFD has received a request to run.

VFD shall be programmable to display feedback signals in appropriate units, such as inches of water column (in-wg), pressure per square inch (psi) or temperature (°F). Examples can be room temperature in °C, return air temperature in °C, supply air temperature in °C, CO<sub>2</sub> concentration in ppm, pressure in bar, differential pressure in PSI etc.

VFD shall be programmable to sense the loss of load. The VFD shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. To ensure against nuisance indications, this feature must be based on motor torque, not current, and must include a proof timer to keep brief periods of no load from falsely triggering this indication.

#### Standard Control and Monitoring Inputs and Outputs

Four dedicated, programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

Two terminals shall be programmable to act as either as digital outputs or additional digital inputs.

Two programmable relay outputs, Form C 240 V AC, 2 A, shall be provided for remote indication of VFD status.

Each relay shall have an adjustable on delay/ off delay time.

Two programmable analog inputs shall be provided that can be either direct-or-reverse acting. Each shall be independently selectable to be used with either an analog voltage or current signal.

The maximum and minimum range of each shall be able to be independently scalable from 0 to 10 V dc and 0 to 20 mA.

A programmable low-pass filter for either or both of the analog inputs must be included to compensate for noise.

The VFD shall provide front panel meter displays programmable to show the value of each analog input signal for system set-up and troubleshooting, One programmable analog current output (0/4 to 20 mA) shall be provided for indication of VFD status. This output shall be programmable to show the reference or feedback signal supplied to the VFD and for VFD output frequency, current and power. It shall be possible to scale the minimum and maximum values of this output. It shall be possible to read the status of all analog and digital inputs of the VFD through serial bus communications. It shall be possible to command all digital and analog output through the serial communication bus. Optional Control and Monitoring Inputs and Outputs. It shall be possible to add optional modules to the VFD in the field to expand its analog and digital inputs and outputs.

These modules shall use rigid connectors to plug into the VFD's control card.

The VFD shall automatically recognize the option module after it is powered up. There shall be no need to manually configure the module.

Modules may include such items as:

Additional digital outputs, including relay outputs

Additional digital inputs

Additional analog outputs

Additional analog inputs, including Ni or Pt temperature sensor inputs

It shall be possible through serial bus communications to control the status of all optional analog and digital outputs of the VFD.

Standard programmable firefighter's override mode allows a digital input to control the VFD and override all other local or remote commands. It shall be possible to program the VFD so that it will ignore most normal VFD safety circuits including motor overload. The VFD shall display FIREMODE whenever in firefighter's override mode. Fire mode shall allow selection of forward or reverse operation and the selection of a speed source or preset speed, as required to accommodate local fire codes, standards and conditions.

A real-time clock shall be an integral part of the VFD.

It shall be possible to use this to display the current date and time on the VFD's display.

Ten programmable time periods, with individually selectable ON and OFF functions shall be available. The clock shall also be programmable to control start/ stop functions, constant speeds, PID parameter setpoints and output relays. It shall be possible to program unique events that occur only during normal work days, others that occur only on non-work days, and others that occur on specific days or dates. The manufacturer shall provide free PC-based software to set up the calendar for this schedule.

All VFD faults shall be time stamped to aid troubleshooting.

It shall be possible to program maintenance reminders based on date and time, VFD running hours, or VFD operating hours.

The real-time clock shall be able to time and date stamp all faults recorded in the VFD fault log.

The VFD shall be able to store load profile data to assist in analyzing the system demand and energy consumption over time.

The VFD shall include a sequential logic controller to provide advanced control interface capabilities.

This shall include:

Comparators for comparing VFD analog values to programmed trigger values  
Logic operators to combine up to three logic expressions using Boolean algebra  
Delay timers  
A 20-step programmable structure

The VFD shall include a Cascade Controller which allows the VFD to operate in closed loop set point (PID) control mode one motor at a controlled speed and control the operation of 3 additional constant speed motor starters.

## **7.0 SERIAL COMMUNICATIONS**

The VFD shall include a standard EIA-485 communications port and capabilities to be connected to the following serial communication protocols at no additional cost and without a need to install any additional hardware or software in the VFD:

Metasys N2  
Modbus RTU

VFD shall have standard USB port for direct connection of Personal Computer (PC) to the VFD. The manufacturer shall provide no-charge PC software to allow complete setup and access of the VFD and logs of VFD operation through the USB port. It shall be possible to communicate to the VFD through this USB port without interrupting VFD communications to the building management system.

The VFD shall have provisions for an optional 24 V DC back-up power interface to power the VFD's control card. This is to allow the VFD to continue to communicate to the building automation system even if power to the VFD is lost.

## **8.0 ADJUSTMENTS**

The VFD shall have a manually adjustable carrier frequency that can be adjusted in 0.5 kHz increments to allow the user to select the desired operating characteristics. The VFD shall also be programmable to automatically reduce its carrier frequency to avoid tripping due to thermal loading. Four independent setups shall be provided.

Four preset speeds per setup shall be provided for a total of 16.

Each setup shall have two programmable ramp up and ramp down times. Acceleration and deceleration ramp times shall be adjustable over the range from 1 to 3,600 seconds.

Each setup shall be programmable for a unique current limit value. If the output current from the VFD reaches this value, any further attempt to increase the current produced by the VFD will cause the VFD to reduce its output frequency to reduce the load on the VFD. If desired, it shall be possible to program a timer which will cause the VFD to trip off after a programmed time period.

If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: external interlock, under-voltage, over-voltage, current limit, over temperature, and VFD overload.

The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.

An automatic "start delay" may be selected from 0 to 120 seconds. During this delay time, the VFD shall be programmable to either apply no voltage to the motor or apply a DC braking current if desired.

Four programmable critical frequency lockout ranges to prevent the VFD from operating the load at a speed that causes vibration in the driven equipment shall be provided. Semi-automatic setting of lockout ranges shall simplify the set-up.

## **9.0 OPTIONAL FEATURES**

All optional features shall be built and mounted by VFD manufacturer as an inbuilt factory solution. All optional features shall be UL listed by the VFD manufacturer as a complete assembly and carry a UL label.

## **10.0 SERVICE CONDITIONS**

Ambient temperature at full speed, full load operation with continuous drive rated output current:

- 10 to 45°C for ratings upto 90 kW without derating
- 10 to 40°C for ratings 110 kW and higher without derating

Relative Humidity: 0 to 95%, non-condensing.

Elevation: Up to 3,300 feet without derating.

AC line voltage variation:  $\pm 10\%$  of nominal with full output.

VFD Enclosure protection: IP 20 with Mains Disconnect switch, integral, with no additional cabinets. – Not applicable. Protection shall be for Indoor installation.

Side Clearances: No side clearance shall be required for cooling.

All power and control wiring shall be done from the bottom.

All VFDs shall be plenum rated.

All the contacts mounted on each VFD should be brought to the terminal blocks of each starter in order to enable BMS vendor to do termination of his cables. None of the terminations of the BMS cables be done directly to the VFD.

## **11.0 QUALITY ASSURANCE**

To ensure quality, the complete VFD shall be tested by the manufacturer. The VFD shall drive a motor connected to a dynamometer at full load and speed and shall be cycled during the automated test procedure.

All optional features shall be functionally tested at the factory for proper operation.

## **12.0 SUBMITTALS**

This specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

## **13.0 ADDITIONAL NOTES**

- VFD's should have inbuilt DC choke.
- THDI on current side shall be limited to 35% (Total harmonics distortion).
- VFD's shall be complete with EMC filters.
- VFD's to work with input voltage variation of  $415V \pm 10\%$
- IP 20 for installation inside panels.
- In open : IP 55

**SUB-HEAD: H. CONSTRUCTION FEATURES & GENERAL NOTES OF LOW VOLTAGE MAIN AND SUB DISTRIBUTION BOARDS/ PANELS/ SWITCH BOARDS/ METER BOARDS/ ACB ISOLATOR PANELS/ MOTOR CONTROLS CENTRES (MCC)**

**GENERAL SPECIFICATIONS**

Main & Sub Distribution Boards shall be classified as FBA (Factory Built Assemblies) as per IS: 8623:1998/ IEC: 60439 Part-I of Cubicle type, Sheet steel clad, Totally enclosed, Dust & Vermin proof, Indoor type/ outdoor type, Rigid, Free standing, Floor mounted compartmentalized, Single front for use on 415 volts, 3 phase, 50 cycles, AC system with a fault level withstand capacity as per B.O.Q./ as required, RMS Symmetrical. Complete with busbars interconnections, power, control/ auxiliary circuits/ wiring & earthing. With powder coated paint finish, switchgear as per B.O.Q of approved makes specified.

**BASE FRAME: 3MM**

Normal Indoor Application: CRCA

Outdoor Application: GI

Sheet Type: PN02/ Equivalent as approved

Sheet Make: TISCO/ Equivalent as approved

**STRUCTURE, COVER BACK & FRONT DOOR: 2MM**

Normal Indoor Application: CRCA

Outdoor Application: GI

Sheet Type: PN02/ Equivalent as approved

Sheet Make: TISCO/ Equivalent as approved

**PARTITIONS: 1.6MM**

Normal Indoor Application: CRCA

Outdoor Application: GI

Sheet Type: PN02/ Equivalent as approved

Sheet Make: TISCO/ Equivalent as approved

**GLAND PLATES: 3MM**

Multi Core Cables: CRCA

Single Core Cables: Aluminum

**MOUNTING PLATES: 2MM**

Normal Indoor Application: CRCA

Outdoor Application: GI

Sheet Type: PN02/ Equivalent as approved

Sheet Make: TISCO/ Equivalent as approved

**CONSTRUCTION**

Completely modular & compartmentalized, form 3B separation. Separate adequately spaced Unit Chamber, Bus bar & cable compartments.

**EXTENSIBILITY**

Readily extensible on both ends.

Panels should be made in easily transportable sections.

**DIMENSIONS**

|                      |                           |
|----------------------|---------------------------|
| Operating height     | 1800mm max.<br>300mm min. |
| Overall height       | 2400mm max.               |
| Compartment size HXW | 225mm x 500mm min         |
| Cable chamber        | 300mm min.                |

## **DEGREE OF PROTECTION**

### **IP: 42 for totally Indoor application.**

- Panels in Substation area, Electrical Rooms, LT Panel Rooms & DG Set Room
- MDB L+P Panel
- Tower Panel
- EWS Panel
- Meter Boards (In Electrical Rooms)
- Lift Panel (In Lift Machine Room)
- AHU Panel
- Basement Ventilation Panel
- Staircase & Liftwell Pressurization Fan Panel (If Indoors)

### **IP: 54 for Indoor Application**

- Plumbing Panel
- Fire Pump Panel
- STP Panel
- AC/ Chiller Panel
- Chiller Auxiliary Panel
- DG Set Auxiliary Panel
- Laundry Panel
- Kitchen Panel

### **IP: 55 for Outdoor Application.**

- Feeder Pillar
- Outdoor Junction boxes
- Outdoor boards/ panels
- ACB Isolators (outdoors)

All outdoor IP 55 panels shall be:

- a. Double door design
- b. With canopy
- c. In GI sheet steel construction in place of CRCA sheet steels to avoid rusting.
- d. Panel shall have forced ventilation mechanism with Rital fan & filter section, to avoid temperature rise and at the same time maintaining IP 55 integrity.

## **DOOR HINGES**

Concealed, Powder Painted

## **DOOR LOCKS**

Zinc alloy powder painted with provision for pad locking..

## **GASKET**

Neoprene/ PE foam of suitable profile to provide desired degree of protection.

## **LIFTING ARRANGEMENT**

Eye bolt of removable design, when removed these shall not leave any opening in the boards.

## **PAINTING**

Pre-treatment eight tank process or on line automatic spray system with oven for drying after Pre-treatment as per IS: 101-1988 effective temperature and concentration control. Powder coating of desired shade as per requirement. Paint thickness min. 60 micron

## **CORROSION RESISTANCE**

Withstand 500 hrs of Salt Spray as per IS: 101-1988

## **BUS BARS MAIN**

Aluminum E-91E grade, min. 53% IACS



Copper min 99% IACS (Tinned copper)  
Configuration: Interleaved 2000A & above

Minimum clearances shall be:

|                  |      |
|------------------|------|
| Phase to Phase   | 32mm |
| Phase to Neutral | 25mm |
| Phase to earth   | 25mm |
| Neutral to earth | 25mm |

#### **BUS BARS EARTH**

As per material of main busbar of size suitable to withstand fault level specified/ as required.  
Continues length of earth bus to be provided.

UPS Output Panels shall have two earth bars of tinned copper of suitable rating. One of the earth buses shall be dedicated i.e. mounted on insulated supports.

#### **BUS BAR TEMP. RISE**

Ambient 45°C  
Maximum bus bar temperature rise 40° C over ambient  
No deration of Switchgear & Panels upto 45°C

#### **BUS BAR SIZING/ CROSS-SECTION**

Bus bars to be sized to carry the full rated load current without exceeding maximum temperature rise as limited above. Bus bar size calculations to be submitted with shop drawings. Busbars to withstand the maximum short circuit current as specified/ as per requirement.

#### **BUS BAR SUPPORTS**

Non Hygroscopic Epoxy/SMC at suitable distance to withstand forces of short circuit as per requirement.

#### **BUS BAR INSULATION**

Black heat shrinkable, fire retardant, self extinguishing type sleeves suitable to withstand 110°C  
Colour coding to be followed as per IS codes. Phase sequences and polarity to be followed as per IS codes.

#### **SHROUDING**

All live parts should be shrouded with IP2 protection Fire Retardant, Non Inflammable, Non Hygroscopic e.g. Polycarbonate, FRP.

#### **HARDWARE**

High tensile for ACB & ACB Bus termination Joints  
Corrosion resistance, Cadmium plated for other joints  
All bolts with spring/ star washer

#### **WIRING**

1100V Fire retardant, virgin PVC color coded flexible wire

|                 |           |
|-----------------|-----------|
| Voltage circuit | 1.5 sq mm |
| Current circuit | 2.5 sq mm |
| Earth circuit   | 2.5 sq mm |

As per IS: 694

#### **WIRING IDENTIFICATION**

Computerized ferrule on both ends as per IS: 375

#### **TERMINAL BLOCK**

Power - Melamine stud type.  
Control - Polyimide color coded screw less clamp fit type.  
Not more than one wire connected to one terminal block.  
Plug in type terminal block at each transport section.

## **COMPONENT LEGEND**

Computerized labels for all control component & terminal block

## **FEEDER DESCRIPTION PLATES**

Powder coated Al. Plate with computerized printing, size:

MDB = 150 x 50 mm

S/DB = 100 x 40 mm

## **SPARE FEEDERS**

It shall be as per B.O.Q./ SLD. If B.O.Q/ SLD does not specify anything, than an average of 20% of a mix of various ratings/ feeders to be provided as spare feeders in each board/ panel. Spare feeders must include a minimum one biggest and a minimum of one smallest rated feeders as spares along with other spares.

## **CABLING**

Provision for top/ bottom/ top & bottom entry of cables, as per requirement/ as per site. Adequately sized cable chambers. Easy and safe termination & maintenance facility.

## **BUS TRUNKING TERMINATION**

Wherever specified in B.O.Q power connection arrangement at top suitable for bus trunking.

## **SWITCHGEAR**

As per specification & Makes specified. IS: 13947 I- IV, 1993

Only one make of switchgear to be used in a board/panel. The switchgear selection shall be as per manufacturer's co-ordination tables.

## **CONTROL COMPONENTS**

As per specification & Makes specified. IS: 13947 I - IV, 1993

## **INDICATING INSTRUMENTS**

Analog/ Digital as per specifications, notes, B.O.Q. & Makes specified. IS: 13779

BMS compatible multifunction meters shall be complete with communication card, shall be networkable and shall be wired on to common RS 485 Bus and information from these meters to BMS to be released at one point.

## **INDICATING INSTRUMENTS ACCESSORIES**

CT/PT-Cast resin as per specifications & make specified. IS: 2705, 1992

## **CONTROL MCB'S/ MPCB'S**

For control and metering circuit/ wiring, these shall be of fault level as required.

## **SPACE HEATER**

All ACB Incomer & bus couplers shall be provided with Space Heater & Thermostat & 11 watt panel illumination. Heaters shall be controlled by a 6A MCB/ MPCB as per the required fault level.

## **SHOP DRAWINGS**

Notes, General arrangement, Elevations, Single line diagram, Bill of material, Control and inter locking scheme to be submitted for approval prior to manufacturing and approval taken from PMC/ Consultant/ Owner.

## **TESTING & PRE-DISPATCH QUALITY CONTROL**

**A.** Fabrication, Pre-treatment, painting, assembly and wiring.

**B. Tests:**

- Physical, Electrical and Operational tests of all Breakers/ Switches.
- Operational check of all meters and relays.
- Dielectric strength test for insulation at 2.5kV for 1 sec.
- Insulation resistance test at 1000V megger,
- Protective measures and continuity of circuits, as per IS: 8623-I, 1993.
- Testing of protection relays by secondary injection kit before commissioning.

- Interlocking Function Test.
- Earth continuity test between various Non-current carryings parts of equipment steel work etc. & the earth bus provided in the panel.

#### **INSPECTION**

To be offered at works to PMC/ Owner.

#### **TEST CERTIFICATE TYPE AND ROUTINE**

Test results for routine tests conducted at works should be submitted. Type tests as per IS: 8623 - Part I for Short circuit, Temperature rise, Degree of protection to meet the specifications and B.O.Q must be furnished.

#### **PACKING**

Wooden Crates/ Wooden Cases/ Polythene & Water proof paper to be used.

#### **AS MANUFACTURED DRAWINGS**

To be submitted in CD format with catalogues and test certificates of switchgear, controlgear and other components used within MDB & PDB.

#### **AFTER SALES SERVICE**

Manufacturer to have an Independent department to render after sales support for Installation, commissioning & trouble shooting during and after warranty period.

#### **OPERATING CONDITIONS:**

- No De-rating of panels, Switchgear/ Equipment & Busbars upto 45 Deg. C & Altitude of 1000M above MSL for indoor panels.
- No De-rating of panels, Switchgear/ Equipment & Busbars upto 50 Deg. C & Altitude of 1000M above MSL for outdoor panels/ feeder pillars.

#### **CONNECTION BETWEEN BUSBARS & SWITCHGEAR**

- Upto 63Amp Switch rating with 1.1 KV grade FRLS PVC insulated flexible single core copper cables. Tinned copper or silver plated copper lugs shall be used on copper wires.
- Above 63Amp Switch rating, with solid aluminium/ copper busbar links, to be used.
- Neutral Bus bars for four pole feeders shall be of the same size as phase.  
Neutral Bus bars for triple pole feeders shall be of 50% size of phase.  
Neutral Bus bars for UPS panels shall be of 200% size of phase.

**IMPORTANT NOTE:** VENDORS TO SUBMIT SWITCHGEAR SELECTION/ RATINGS FOR ALL THE PANELS ALONG WITH THE BID.

## SUB HEAD: I: 24 VOLTS DC BATTERY CHARGER

**a. Scope:**

This section covers supply, installation, testing and commissioning of Battery and Battery charger.

**b. 24 volts DC battery:**

12 volts each 180AH, (25 plates battery each) batteries comprising of 2 Nos. standard lead acid stationary tubular type batteries.

- i. MS painted/ powder coated battery enclosure with rubber pads or spill proof plastic trays.
- ii. Set of connectors with ends take-off suitable for connections.
- iii. Spring type hydrometer.

**c. Battery charger:**

Battery float cum boost charger of continuous load current plus boost charge current & capable of achieving required specific gravity & suitable for charging batteries. The charger shall have following accessories:

- i. 1 No. rotary switch to select auto float/ manual float/ manual boost. During auto float mode automatic changeover shall take place from float mode to boost mode and vice versa.
- ii. Single phase double copper wound impregnated naturally air cooled mains transformer.
- iii. 1 Set solid state constant potential controller to stabilize the DC output voltage of the float cum boost charger at + 2% of time set value of AC input voltage variation of 230V±10%, frequency variation of ±5% from 50Hz and simultaneous load variation of 0-100% and also complete with Current Limiting Circuit to drop the Float Charger output voltage upon overloads to enable the battery to take over.
- iv. 1 No. electronic controller to automatically changeover battery charging from boost to float and vice versa.
- v. 1 No. DC ammeter and toggle switch to read charger output current and battery charge/ discharge current.
- vi. 1 No. moving coil DC voltmeter to read the DC output voltage.
- vii. 2 Sets potentiometer to adjust the output voltage during manual/ auto float and boost modes.
- viii. 1 No. double pole ON /OFF MCB for Charger Output (24V DC rating)
- ix. 2 Sets DC output terminals. 1 set for the load and the other set for the battery.

Alarm annunciation: Visual and audible alarm with manual accept reset facility shall be provided for the following:

- a. AC mains failure
- b. Charger Failure
- c. Load/ Output over voltage

**Rating:**

|                    |   |
|--------------------|---|
| AC Input           | 230±10% AC 50Hz single phase.   |
| DC output          | To float/ boost charge 24V suitable rating batteries and also supply a continuous load.               |
| Current Rating     | As battery rating   |
| Float Mode         | 27.0V nominal (adjustable) between 24-28.0V   |
| Boost Mode         | 28.2V nominal (adjustable) between 24-29.0V   |
| Voltage regulation | ±2% for AC input variation of 230V ± 10%. Frequency variation of 50Hz±5% and DC load variation 0-100% |
| Ripple             | Less than 5%  |

**SUB-HEAD: J. 415V, 3 PHASE, 50HZ, 3/4/5 POLES RISING MAINS & BUS DUCTS: COMPACT SANDWICH TYPE (IP54, IP 55 & IP 66)**

**1. SCOPE**

This specification covers sandwich type busbar trunking for use as feeder busbars for interconnection between separate electrical equipment/ load centers, and for use as plug in busbar risers.

**2. IP RATING**

Following minimum IP rating for Rising Mains & Bus ducts is to be considered, even if it is not specified in the BOQ:

|       |   |                                  |  |
|-------|---|----------------------------------|--|
| IP 54 | : | Rising Mains with floor tap-offs | In Electrical shafts, running through electrical rooms   |
| IP 55 | : | Bus Ducts (Indoor)               | In Basements, in Parking, In Garages, In Substation area, in DG set room, in LT Panel room, in Electrical rooms in Plant room. |
| IP 66 | : | Bus ducts (Outdoor)              | In open, but overhead and with additional canopy   |
| IP 68 | : | Bus ducts (Outdoor)              | Cast Resin, In ground, in trench, in tunnel  |

**Note:** Above mentioned IP ratings to be considered even if not mentioned in BOQ.

**3. INSULATION TYPE & CLASS**

|           |   |   |
|-----------|---|---|
| Class 'B' | : | <ul style="list-style-type: none"> <li>Insulation shall be minimum 2 layers of Mylar on each conductor (Dupont or PET Make)</li> <li>This insulation shall be able to withstand a max. temperature of 130°C.</li> </ul> |
| Class 'F' | : | <ul style="list-style-type: none"> <li>Insulation shall be Epoxy coating (3M Make).</li> <li>This insulation shall be able to withstand a max. temperature of 155°C.</li> </ul>   |
| Class 'H' | : | <ul style="list-style-type: none"> <li>Insulation shall be Epoxy coating (3M Make).</li> <li>This insulation shall be able to withstand a max. temperature of 180°C.</li> </ul>   |

**4. INSULATION VOLTAGE**

The rated operational voltage of Rising Main/ Bus duct shall not be less than 650 volts & insulation voltage of 1000 volts.

**5. HOUSING**

The housing of rising main & bus bar (IP 54, IP 55, IP 66) shall be 3mm thick extruded aluminium alloy, two piece housing.

**6. BUS BARS**

Bus bars shall be high purity, electrolytic grade Aluminium conductor/ Copper conductor as specified in BOQ.

Bus bars shall be 3P + 50% N, 3P + 100% N, 3P + 200% N, with or without internal earth bus as specified in BOQ's.

**7. STANDARDS & SHORT CIRCUIT RATINGS**

Bus bars shall be designed & manufactured as per following standards:

- Short circuit withstand capacity for 1 sec. shall be as per BOQ.
- Standards applicable : IEC 60439-1&2, IEC 60947, IEC 60529 & IEC 60331 for Cast Resin bus bars.
- Certification: KEMA certified.

**8. FLEXIBLE CONNECTIONS**

Tinned copper flexible connections to be employed at panel, transformer & DG set/ alternator ends.

**9. EXPANSION JOINTS**

Tinned copper flexible connections are to be provided at building expansion joints & also for liner horizontal distances 40M and above/ or as per manufacturer's recommendation.

**10. ELBOWS, BENDS, OFFSETS, END FEED BOXES, FLANGED ENDS**

All the accessories required to make the installation complete shall have to be provided as per site conditions.

**11. CONSTRUCTION FEATURES:**

|                                |   |   |
|--------------------------------|---|---|
| Bus bar joints                 | : | Joints shall be tinned  |
| Straight lengths               | : | The standard length shall be 3M to 4M but actual site measurement to be taken to decide on required length. A maximum of 3 plug outlet may be fixed on each side of 3M length as per the requirement.   |
| Joint temperature Indicator    | : | The busbar system shall have a colour coded temperature indicator to give an early warning when high temperature occurs at the joint.   |
| Joint Design                   | : | <ul style="list-style-type: none"><li>• The busbar joint system shall be single bolt design, double headed "break off" joint bolt to tighten the busway with no torque wrench required.</li><li>• Belle ville spring washers shall be used to ensure pressure is evenly applied across the joint.</li></ul>   |
| Plug in System / Tap-off units | : | <ul style="list-style-type: none"><li>• Plug in system shall be push in &amp; pull out with interlock mechanism, preventing 'ON' load connection.</li><li>• Plug in pins shall be silver plated &amp; design of pins shall be fail safe to prevent incorrect phase installation.</li><li>• Plug in outlet shall also be grounded.</li><li>• Plug in boxes shall be 3P/ 4P circuit breakers (MCCB's) including rotary handles. The breakers shall be with thermal magnetic releases and shall be of fault rating as per the fault at that level.</li></ul> |
| Vertical Installation          | : | It shall be vertical spring hanger design. To be designed & supplied by the manufacturer, to withstand safely without fail the "Seismic Conditions" of site.  |
| Horizontal Installation        | : | To be designed & supplied by the manufacturer, to withstand safely without fail the "Seismic Conditions" of site.   |

**12. TEST AT WORKS**

The following factory tests shall be carried out and test results to be recorded:

- Temperature rise (Type test with no extra cost).
- Insulation resistance shall be tested with 1000 V megger and shall be not less than 100 mega ohms. The testing shall be done as per IS: 8084-1976.
- Earth continuity test.

**13. TEST AT SITE**

The following tests shall be carried out at site and test results to be recorded:

- Insulation resistance shall be tested with 1000 V megger and shall be not less than 100 mega ohms. The testing shall be done as per IS: 8084-1976.
- Earth continuity test.

## **SUB HEAD K: INTELLIGENT REPORTING FIRE DETECTION SYSTEM**

### **GENERAL**

#### **DESCRIPTION:**

This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

#### **SCOPE:**

A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

#### **Basic Performance:**

Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 6 (Class A) Signaling Line Circuits (SLC).

Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.

On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.

Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.

NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

Two-way telephone communication circuits shall be supervised for open and short circuit conditions.

### **DRAWINGS & TECHNICAL SUBMITTALS**

#### **General:**

Two copies of all submittals shall be submitted to the Architect/Engineer for review.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from

other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

**Shop Drawings:**

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

Show annunciator layout, configurations, and terminations.

**Manuals:**

Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

**Software Modifications**

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

**Certifications:**

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

**WARRANTY:**

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

**POST CONTRACT MAINTENANCE:**

Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the warranty.

As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/ repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the warranty.



Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.

Each circuit in the fire alarm system shall be tested semiannually.

Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

**POST CONTRACT EXPANSIONS:**

The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

Submittals that do not include this estimate of post contract expansion cost will not be accepted.

**APPLICABLE STANDARDS AND SPECIFICATIONS:**

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

National Fire Protection Association (NFPA) - USA:

|           |                                       |
|-----------|---------------------------------------|
| NFPA 13   | Sprinkler Systems                     |
| NFPA 16   | Foam/Water Deluge and Spray Systems   |
| NFPA 17   | Dry Chemical Extinguishing Systems    |
| NFPA 17A  | Wet Chemical Extinguishing Systems    |
| NFPA 2001 | Clean Agent Extinguishing Systems     |
| NFPA 72   | National Fire Alarm Code              |
| NFPA 76   | Telecommunication Facilities          |
| NFPA 101  | Life Safety Code                      |
| NFPA 90A  | Air conditioning & ventilation system |
| EN 54     | European Standards                    |

B. Underwriters Laboratories Inc. (UL) - USA:

|         |  |
|---------|--|
| UL 268  | Smoke Detectors for Fire Protective Signaling Systems                                    |
| UL 864  | Control Units for Fire Protective Signaling Systems <b>9<sup>th</sup> Edition Listed</b> |
| UL 268  | A Smoke Detectors for Duct Applications  |
| UL 521  | Heat Detectors for Fire Protective Signaling Systems                                     |
| UL 464  | Audible Signaling Appliances   |
| UL 38   | Manually Actuated Signaling Boxes  |
| UL 346  | Water flow Indicators for Fire Protective Signaling Systems                              |
| UL 1971 | Visual Notification Appliances   |
| UL 228  | Door Holders   |

NATIONAL BUILDING CODES  
DELHI FIRE CODES

The Video Display Terminal (VDT) shall comply with Swedish magnetic emission and X-radiation guidelines MPR 1990:10.

#### **APPROVALS:**

The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc (**9<sup>th</sup> Edition**) / EN 54

The fire alarm control panel shall meet UL Standard 864 9<sup>th</sup> Edition (Control Units).

The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of high and low pressure CO2.

#### **PRODUCTS**

##### **EQUIPMENT AND MATERIAL, GENERAL:**

All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

All equipment shall be attached to walls and ceiling/ floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

##### **CONDUIT AND WIRE:**

###### **Conduit:**

Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

Conduit shall be 25mm minimum, 16G MS.

###### **Wire:**

All wires shall be of FRLS PVC insulated copper conductor as per BOQ

##### **MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:**

The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, panel modules including initiating circuits, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system controlled devices.

1. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
  - a. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
  - b. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to monitor and control modules.
  - c. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.
  - d. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.
2. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
  - a. The system alarm LED shall flash.
  - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
  - c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
  - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
  - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
3. When a trouble condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
  - a. The system trouble LED shall flash.
  - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
  - c. The 640-character backlit LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
  - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
  - e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.
4. When a supervisory condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
  - a. The system trouble LED shall flash.
  - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
  - c. The 640-character backlit LCD display shall indicate all information associated with the supervisory condition, including the type of trouble point and its location within the protected premises.

- d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
  - e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.
5. When a security alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
- a. The system security LED shall flash.
  - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
  - c. The 640 -character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
  - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
  - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6. When a pre-alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
- a. The system pre-alarm LED shall flash.
  - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
  - c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
  - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
  - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

### **Operator Control**

#### **Acknowledge Switch:**

- a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.
- b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

#### **Signal Silence Switch:**

Depression of the Signal Silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

1. **Drill Switch:**  
Depression of the Drill switch shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
2. **System Reset Switch:**  
Depression of the System Reset switch shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.
3. **Lamp Test:**  
The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.
4. **Scroll Display Keys:**  
There shall be Scroll Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE and OTHER EVENTS. Depression of the Scroll Display key shall display the next event in the selected queue allowing the operator to view events by type.
5. **Print Screen:**  
Depression of the PRINT SCREEN switch shall send the information currently displayed on the 640character display to the printer.

**System Capacity and General Operation:**

1. The control panel shall be capable of expansion via up to 10 SLC modules. Each module shall support a maximum of 318 analog/ Intelligent/ addressable devices for a maximum system capacity of 3180 points. The system shall be capable of 3072 annunciation points per system regardless of the number of addressable devices.
2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company/ software programming.
3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

**The FACP shall be able to provide the following software and hardware features:**

- a. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/ initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
- b. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
- c. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
- d. Action: If programmed for action, and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on alarm level.

- e. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
- f. Device Blink Control: Means shall be provided to turn off detector/ module LED strobes for special areas.
- g. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the requirements of NFPA 72.
- h. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
- i. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/ laptop.
- j. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
- k. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
- l. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
- m. Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or "drill". If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function
- n. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
- o. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
- p. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
- r. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
- s. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
- t. Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broad cast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, pre-alarms, disabled points and activated points, all installed

points filtered by SLC points, panel circuits, logic zones, annunciators, releasing zones, spal zones, and trouble zones.

- u. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
- v. Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will resound the panel sounder.
- w. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
- x. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen. Graphic shall display when all systems are normal.
- y. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result or product of all cooperating detectors chamber readings.
- z. Tracking/Latching Duct: The system shall support both tracking and latching duct detectors.
- aa. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
- bb. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
- cc. Security Monitor Points: The system shall provide means to monitor any point as a type security.
- dd. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/ verification.
- ee. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
- ff. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.

- gg. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
- hh. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
- ii. 10 trouble equations per device: The system shall provide support for up to 10 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
- jj. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
- kk. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone with four abort options to satisfy any local jurisdiction requirements.
- ll. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector or indicating panel module input. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

### **Central Processing Unit**

1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.
2. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
3. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
4. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
5. Consistent with UL864, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.
6. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.
7. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.



8. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
9. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.
10. The CPU shall provide one high-speed serial connection for support of network communication modules.
11. The CPU shall provide double pole relays for FIRE ALARM, SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts.

### **Display**

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The system display shall provide a 640 character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide ten Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, and CPU FAILURE.
4. The system display shall provide a QWERTY style keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming/ software programming.
5. The system display shall include the following operator control switches: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the 640character LCD.

### **Loop (Signaling Line Circuit) Control Module:**

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Photoelectric, Thermal etc.) and 159 monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/ degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 6 (Class B) circuit.
4. The SLC interface board shall be able to drive an NFPA Style 6 twisted shielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 6, no twist, no shield circuit up to 3,000/ 14,000 feet in length. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.
5. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine any no. whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the

accumulation of dust in each detector. The analog information may also be used for automatic/ by module detector testing and the automatic determination of detector maintenance requirements.

**Enclosures:**

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.
4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

**Power Supply:**

1. The Addressable Main Power Supply shall operate on 240 VAC, 50 Hz, and shall provide all necessary power for the FACP.
2. The Addressable Main Power Supply shall provide sufficient power to the CPU, using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
3. The Addressable Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 25-200 amp-hours within a 48-hour period.
4. The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Addressable Main Power Supply shall be power-limited per 1995 UL864 requirements.

**System Circuit Supervision:**

1. The FACP shall supervise all circuits to intelligent devices, annunciators and conventional peripherals and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate that device or devices are not responding and print the information in the history buffer and on a printer.
2. Sprinkler system valves, standpipe control valves, PIV and main gate valves shall be supervised for off-normal position.

**Field Wiring Terminal Blocks:**

All wiring terminal blocks shall be the plug-in/ removable type and shall be capable of terminating up to 12 AWG wire. Terminal blocks that are permanently fixed to the PC board are not acceptable.

**Printer**

1. Printers shall be of the automatic type, printing code, time, date, location, category, and condition.
2. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table and UL, ULC listed. The printer shall communicate with the control using an interface complying with Electrical Industries Association standard EIA-232D. The printer power shall be 230 VAC @ 50 Hz.

3. Thermal printers are not acceptable.
4. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery backup if AC mains are lost. The strip printer shall be UL 864 listed.

### **Field Programming**

1. The system shall be programmable, configurable and expandable in the field with/ without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/ information.
2. It shall be possible to program through the standard FACP keyboard all system functions/ software.
3. All field defined programs shall be stored in non-volatile memory.
4. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/ zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password.

### **Specific System Operations**

1. Smoke Detector Sensitivity Adjust: Software means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
2. Alarm Verification: Each of the intelligent addressable Smoke Detectors in the system may independently selected and enable to be an alarm verified detector. The alarm verification function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or any time after system turn on. Alarm verification shall not require any additional hardware to be added to the control panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. System Point Operations:
  - a. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
  - b. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
4. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
  - a. Device Status.
  - b. Device Type.
  - c. Custom Device Label.
  - d. Software Zone Label.
  - e. Device Zone Assignments.
  - f. Analog Detector Sensitivity.
  - g. All Program Parameters.
5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:
6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time

and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed.

The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.

7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

### **Signaling Line Circuits (SLC)**

Each FACP or FACP network node shall support up to two SLCs. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159/125 intelligent modules (monitor or control) for a loop capacity of 318 devices. The addition of the optional second loop shall double the device capacity, supporting a total of 636 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

### **Serial Interfaces**

The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.

One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

One EIA-232 interface shall be used to connect a UL-listed CRT terminal. This interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.

The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

### **Digital Voice Command Center**

The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.

Function: The Voice Command Center equipment shall perform the following functions:

Operate as a supervised multi-channel emergency voice communication system.

Operate as a two-way emergency telephone system control center.

Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.

Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.

Provide all-call Emergency Paging activities through activation of a single control switch.

As required, provide vectored paging control to specific audio zones via dedicated control switches.

Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.

Provide a software utility capable of off-line programming for the VCC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the VCC shall not inhibit the emergency operation of other nodes on the fire alarm network.

Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SCL controlled switching.

The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.

The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

### **Audio Amplifiers**

The Audio Amplifiers will provide Audio Power (@70 Volts RMS) for distribution to speaker circuits.

Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).

The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:

- Earth Fault on DAP A (Digital Audio Port A)
- Earth Fault on DAP B (Digital Audio Port B)
- Audio Amplifier Failure Detected
- Trouble
- Active Alarm Bus input
- Audio Detected on Aux Input A
- Audio Detected on Aux Input B
- Audio Detected on Fire Fighter's Telephone Riser
- Receiving Audio from digital audio riser
- Short circuit on speaker circuit 1
- Short circuit on speaker circuit 2
- Short circuit on speaker circuit 3
- Short circuit on speaker circuit 4
- Data Transmitted on DAP A
- Data Received on DAP A
- Data Transmitted on DAP B
- Data Received on DAP B
- Board failure
- Active fiberoptic media connection on port A (fiberoptic media applications)
- Active fiberoptic media connection on port B (fiberoptic media applications)
- Power supply Earth Fault
- Power supply 5V present
- Power supply conditions – Brownout, High Battery, Low Battery, Charger Trouble

The audio amplifier shall provide the following built-in controls:

Amplifier Address Selection Switches

Signal Silence of communication loss annunciation

Reset

Level adjustment for background music

Enable/ Disable for Earth Fault detection on DAP A

Enable/ Disable for Earth Fault detection on DAP A

Switch for 2-wire/ 4-wire FFT riser

Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.

Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).

System shall be capable of backing up digital amplifiers.

### **Audio Message Generator (Prerecorded Voice)/ Speaker Control:**

Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.

Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.

A built-in microphone shall be provided to allow paging through speaker circuits.

### **Speaker Switches/ Indicators**

The speaker circuit control switches/ indicators shall include visual indication of active and trouble status for each speaker circuit in the system.

The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.

### **Fire Fighters Telephone System**

The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.

The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

### **Waterflow Operation**

An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display; turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

Supervisory Operation

An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

Signal Silence Operation

The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

### **Non-Alarm Input Operation**

Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

## **SYSTEM COMPONENTS:**

### **Printer**

The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 230 VAC @ 50 Hz.

The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

### **Repeater Panel (RP)**

A repeater panel shall be provided to display all system intelligent points. The RP shall be capable of displaying all information for all 10,000 possible points on the network. Network display devices, which are only capable of displaying a subset of network points, shall not be suitable substitutes.

The RP shall include a minimum of 640 characters, backlit by a long life, solid state LCD display. Additionally, the network display shall include ten soft-keys for screen navigation and the ability to scroll events by type. i.e. Fire Alarm, Supervisory Alarm, Trouble, etc.

The network control annunciator shall have the ability to display up to eight events in order of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.

The RP shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use. The network shall support a minimum of 103 network control annunciators (not to exceed total node capacity) and shall connect to the network over either a wire or fiber interface.

The network control annunciator shall have an event history buffer capable of storing a minimum of 1000 events in non-volatile memory. Additionally, the RP shall have a fire alarm history buffer capable of storing a minimum of 200 events in non-volatile memory. Systems that do not protect fire alarm events from being overwritten by other events are not suitable substitutes.

The RP shall include two optically isolated, 9600 baud, industry standard EIA-232 ports for UL864 listed printers and CRT's. These peripheral devices shall print or display network activity.

The network control annunciator shall include control switches for system wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test. A mechanical means by which the controls switches are "locked out", such as a key, shall be available.

The RP shall include long life LEDs to display Power, Fire Alarm, Pre-Alarm, Security Alarm, System Trouble, Supervisory, Signals Silenced, Disabled Points, Other (non-fire) Events, and CPU Failure.

The network control annunciator shall include a Master password and up to nine User passwords. Each password shall be up to eight alpha-numeric characters in length. The Master password shall be authorized to access the programming and alter status menus. Each User password may have different levels of authorization assigned by the Master password.

The RP shall allow editing of labels for all points within the network; control on/off of outputs; enable/ disable of all network points; alter detector sensitivity; clear detector verification counters for any analog addressable detector within the network; clear any history log within the network; change the Time/ Date settings; initiate a Walk Test.

The network control annunciator shall support an optional Windows™ based program utility. This utility shall allow the user create an RP database, upload/ download an RP database, and download an upgrade to the RP executive. To ensure program validity, this utility shall check stored databases for errors. A compare function shall be included to identify differences between databases.

For time keeping purposes the RP shall include a time of day clock.

Each RP shall support up to 32 additional 80 character remote display annunciators for displaying network activity. These "Terminal Mode" displays will mimic the activity appearing on the corresponding RP.

**Speakers:**

All speakers shall operate on 70 VRMS or with field selectable output taps from 0.25 to 2.0 Watts.

Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).

Frequency response shall be a minimum of 400 HZ to 4000 HZ.

The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

**Graphic User Interface (GUI)**

The GUI shall utilize a Microsoft(tm) operating system. Each Network Control Station shall be capable of graphically annunciating and controlling all network activity. Network display devices that are only capable of displaying a subset of network points shall not be suitable substitutes.

The GUI shall be an IBM (or compatible) personal computer with the following minimum requirements: Intel Pentium II(tm)-processor, operating at a minimum of 400 Mhz, 128Mbytes of RAM, 8 Mbytes Video RAM, 1.44 Mbyte floppy drive, 3.2 Gbyte hard disk, mouse, 32X CD-ROM, 3PCI/ 1 ISA expansion slots, internal 3.2 Gbyte tape drive, sound card, 200 watt power supply, and SVGA graphics with a screen resolution of 1024 x 768. The network control station shall include a 19-inch monitor.

The GUI shall be capable of storing over 100,000 network events in a history file. Events shall be stored on hard disk and shall be capable of back-up storage to a tape drive. The history buffer allows the operator to view events in a chronological order. A filter shall be available for displaying chronological events by operator, date, time, fire alarms, troubles (including security, supervisory and system/ device), disabled points/zones, system programming, operator response and operator log in/log out. The ability to print GUI history files shall also be available.

The GUI shall use a Windows(tm) dialog box technology to address, interrogate, control, and/or modify intelligent points on each fire alarm node. This shall include, and not be limited to: Activating outputs, enabling or disabling points, adding or removing intelligent points, viewing intelligent detector sensitivity levels and modifying point information (custom messages, detector type, verification, day/night selection etc.)

The GUI shall include the ability to display system information in a graphical (floor plan) form. Each view, created using standard Windows bitmap files, shall include icons created for intelligent devices. These icons shall blink and change to the appropriate programmed icon when an event occurs. When the device has been acknowledged, the icon shall become steady. Once the point has returned to normal, the normal icon is displayed. In addition to the graphical representation of the device, the user shall be able to link pictures, documents and sound files to the device. The GUI shall also provide the ability to auto-vector to the floor plan (screen) of the device that is active. By selecting a device in the graphic presentation, the operator of the GUI shall have the ability to log onto the corresponding node and interrogate the associated intelligent point.

The GUI shall have the ability to provide the following information through a Windows(tm) pull down menu: An Event Counter that contains the number of new and total events on the network. The information that is displayed shall consist of Fire Alarms, Pre-Alarms, Security Alarms, Supervisory Alarms, and Troubles. Detailed Event windows that contain all Off-Normal events, both unacknowledged and acknowledged that are present in the system. It shall contain two views, Fire events and Non-fire events that shall be user selectable. A Current Event window that shall contain all network and local events as well as system messages with a maximum of 1,000 events displayed. A Disabled Device window that shall contain all disabled devices in the system.

The GUI shall have the option, from a Windows pull down menu, to connect to a third party paging service that allows the GUI to automatically send text-based messages regarding system status to a typical text pager.

The GUI shall include help screens, available to aid the user without leaving the selected application screen.

The GUI shall be UL-Listed for fire protection (UL864) and burglary (UL1076).

The GUI shall meet FCC regulations (Part 15, subpart J) regardless of its connection means to the network.



The GUI shall have a flexible way of assigning operator passwords. There shall be an unlimited number of possible operators, each with specific levels of control. Each operator shall have his/her own password. Operator password and control selection shall be available to a high level "administrator" who shall have complete control over levels of control. If no action has taken place on the GUI after 10 minutes, the current operator shall be logged out and require a new log-in.

The GUI shall include an industry-standard EIA-232 port for a UL864 listed printer.

The GUI shall be a table top hardware configuration.

### **Video Display Terminal**

The Video Display Terminal shall provide a visual display and an audible alert of all changes in status of the system and shall annotate such displays with the current time-of-day and date.

The Video Display Terminal shall be enclosed in a cabinet suitable for placement on a desktop or table.

A detachable keyboard shall be provided that may be used for programming, testing, and control of the system. Individual keys shall be provided on the keyboard for the ACKNOWLEDGE, RESET, LAMP TEST, SYSTEM TEST, and SIGNAL SILENCE functions of the control panel.

The video display terminal shall include a count of all alarms and troubles in the system, as well as a count of all alarms and trouble requiring acknowledgment. These counts shall be continuously displayed during all FACP operations.

### **SYSTEM COMPONENTS - ADDRESSABLE DEVICES**

#### Addressable Devices - General

Addressable devices shall use simple to install and maintain decade, decimal address switches/ software adjustable. Devices shall be capable of being set to an address in a range of 001 to 159/125. Alternatively the loop controller shall electronically addresses each detector, saving valuable time during system commissioning. Each detector shall have its own unique serial number stored in its "on-board memory". The loop controller shall identify each device on the circuit and assigns a "soft" address to that device's serial number.

Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.

Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

Addressable smoke and thermal detectors multicriteria shall provide dual alarm and power/ polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both single LEDs shall be placed into steady/ flash red illumination by the control panel, indicating that an alarm condition has been detected, red & green LED shall glow steady if the detector senses fine in the stand alone mode. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED. Alternatively the detector shall have Twin LEDs which shall be visible from any direction. A flashing GREEN LED shows normal system polling from the loop controller. A flashing RED LED means the detector is in alarm state. Both LEDs on steady shows alarm state - stand-alone mode.

Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7. The panel on a time-of-day basis shall automatically adjust sensitivity.

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device.

Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

#### **Addressable Manual Fire Alarm Box (manual station)**

Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

#### **Smoke Detector - Multi-Sensor Photo Thermal**

Provide analog/ addressable multisensor smoke detectors at the locations shown on the drawings. Alarm condition shall be based upon the combined input from the photoelectric and thermal detection elements. Separately mounted photoelectric detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is an acceptable alternative. The detector shall have the ability to set the sensitivity and alarm verification of each individual detector on the circuit. It shall be possible to automatically set the sensitivity of individual analog/addressable detectors for the day and night periods.

Each smoke detector shall be capable of transmitting prealarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

#### **Intelligent Thermal Detectors**

Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

#### **Intelligent Multi-Criteria Sensing type Photoelectric Smoke Detector**

The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall be in position to work in advance multi Criteria Sensing, on command from the control panel, send data to the panel representing the analog level of smoke density.

### **Intelligent Duct Smoke Detector**

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

### **Addressable Control Module**

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
3. Audio/ visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

### **Addressable Relay Module**

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

### **Isolator Module**

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

### **Fire Fighter Telephone**

Firefighters' telephones shall be typically installed in corridors, lobbies, mechanical rooms, stairways, or other strategic locations. When lifted from its cradle, or plugged into a suitable wall jack, the handset shall activate audible and visible signals at the control panel. There, the operator needs only to lift the handset off the cradle to respond to the current call. Other firefighters' telephones may be selected at the control panel to join the conversation.

### **BATTERIES:**

The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

If necessary to meet standby requirements, external battery and charger systems may be used.

**EXECUTION  
INSTALLATION:**

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

**TEST:**

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all waterflow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.  
Open and short notification appliance circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

**FINAL INSPECTION:**

At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

**INSTRUCTION:**

Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

## **SUB HEAD L. IP CCTV SURVEILLANCE SYSTEM:**

### **1. INTENT OF SPECIFICATION**

- a) This specification is intended to cover the following activities and services in respect of IP video surveillance system for Plant Surveillance System with all components and accessories. The Activities are: -
- o Designing of complete system using specification for different equipment and cables.
  - o Procurement of all required materials by contractor and organizing pre-dispatch inspection at contractor's place.
  - o Providing engineering data, drawings and O&M manuals of all equipment for Owner's records.
  - o Packing and transportation from the contractor's place to the site. In case of imported items Customs/ port clearance, if required shall be organized by the contractor.
  - o Receipt, unloading, handling, storage, insurance, preservation and conservation of equipment at site. However client may provide space for site office.
  - o Pre-assembly fabrication if any, erection, testing, commissioning and putting into satisfactory operation of all the equipment, cabling and complete IP video surveillance system in a planned and systematic manner acceptable to the Owner. This includes the earthing of camera & equipments also. All items required for earthing and erecting work is to be done by vendor.
  - o Furnishing of spares on FOR site basis.
- b) The bidder shall be responsible for providing all material, equipment and services specified or otherwise which are required to ensure and fulfill the intent of operability, maintainability and the reliability.
- c) It is not intended to specify completely herein all aspects of design and construction of equipment; nevertheless, the equipment shall conform in all workmanship and shall be capable of performing in continuous commercial operation in industrial environment round the clock.
- d) The equipment offered by the Bidder shall be complete in all respects. Any material and component not specifically stated in this specification shall be deemed to be included unless specifically excluded. All such Equipment/ accessories shall be supplied without any extra cost.
- e) Design and manufacturing shall be such that equipment/accessories of same type and ratings are interchangeable.

### **2. SCOPE OF WORK**

- The scope of work includes design, manufacture, shop testing, packing and transport to site/ storage before erection, installation, commissioning and testing of the complete system. The details of scope of work are as follows:
- a) Preliminary survey of the site and locations of IP cameras and cable route, finalization of same in consultation with engineer-in-charge and submission of detailed time schedule for executing the work.
  - b) Submission of final drawing as detailed.
  - c) Design, manufacture and shop testing of all the equipment as per Bill of Material at vendor's place and organizing the pre-dispatch inspection as per quality plan. This includes the NVR application and client software also (original with licenses).
  - d) Packing, transporting and then storage of the material at site till installation of equipment.
  - e) Organizing and executing the cable trenching, cable laying, termination/ finalized in the route and erection of GI pole for IP camera at designated locations.
  - f) Fixing of cameras and junction boxes on the GI pole.
  - g) Fixing of network switches, media converters at different locations in racks.
  - h) All interconnections, all IO terminations, all cores of fiber optic cable, power cable, media converters, access points as per the requirement.
  - i) Installation of network video recorder (NVR), PCs, keyboards in both control room as per the requirement.
  - j) Installation, testing and commissioning of the complete system and test run of the same for 15 days.
  - k) Demonstration of all features of the system to client and commencing the trial run for 15 days after test run.
  - l) Submission of all test reports, as built drawings, all technical documents, manuals etc.

- m) Any supply of item and work to be executed related with successful working of complete system reliability (with all features working) which is not included in the above points has to be informed by the vendor and same has to be supplied/ executed by them at no extra cost.
- n) Providing training to client personnel on all aspects of the system, programming and maintenance.
- o) Warranty period shall be for a period of 36 months for the entire system from the date of acceptance by client i.e. issue of completion certificate by competent authority. All systems including units, assemblies, and sub assemblies shall be covered under warranty. Any parts found defective during warranty period shall be replaced by the contractor without any charges whatsoever.
- p) The contractor should attend all breaks down jobs within 24 hours.

### **3. BRIEF OVER VIEW OF IP VIDEO SURVEILLANCE SYSTEM:**

- 3.1 It is decided to have main control room at Security department having network video recording system (NVR) with the required software and data storage facility installed from where apart from cameras control facility, the recording of all cameras output for suitable duration can be done. The control functions of cameras shall be provided at Security department. The cameras shall have the day and night vision capability and should be able to withstand the outdoor industrial environment condition. Simultaneously the monitoring on a 32" Plasma LCD monitor screen of all/selected cameras shall be available with the help of PC if required.
- 3.2 Surveillance CCTV system is required to ensure effective surveillance of an area as well as create a tamperproof record for post event analysis. The System shall provide an online display of video images on TFT monitors at central control rooms.
- 3.3 System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the LAN.
- 3.4 System should provide inter-operability of hardware, OS, software, networking, reporting, and communication protocols. System expansion should be possible through off-the-shelf available hardware.
- 3.5 Equipment with better specifications shall be accepted.

### **4. GENERAL SPECIFICATIONS:**

- 4.1 Proposed IP surveillance system shall be an open standard based integrated system with IP network centric functional and management architecture aimed at providing high-speed manual/ automatic operation for best performance.
- 4.2 System shall use video signals from various IP cameras installed at different locations, process them for viewing on workstations/ NVR/ monitors at central Control Room and simultaneously record all the cameras after compression using MPEG-4 or better standard. The system shall also have capability and provision to transmit video signals in real time to user defined remote locations. It should also be possible to monitor and control the cameras through an IP network from a remote location.
- 4.3 The NVR/ CAMERA SERVER can be embedded type or server based. However the NVR/ CAMERA SERVER software shall run on common off the shelf available servers/ NVR (Camera server & Database server). NVR/ Camera Server shall be able to handle 16 or more cameras.
- 4.4 Network Video Recorder shall offer both video stream management and video stream storage management. Recording frame rate & resolution in respect of individual channel shall be programmable.
- 4.5 System should ensure that once recorded, the video cannot be altered
- 4.6 System shall provide sufficient storage of all the camera recordings for a period of 30 days or more @ 25 FPS, at 720p or better quality using necessary compression techniques for all cameras (extended capacity of cameras i.e. present capacity + 25 %).
- 4.7 System shall use IP enabled cameras. The video shall be compressed using MPEG-4 or better standard and streamed over the IP network.
- 4.8 The recording resolution and frame rate for each camera shall be user programmable.

- 4.9 The Area under surveillance shall be monitored and controlled from Central Control Room through NVR and workstations.
- 4.10 Surveillance System shall operate on 12V DC/ POE/ 230 V, 50 Hz single phase power supply. Power for all the equipment will be conditioned using on-line UPS. If any equipment operates on any voltage other than the supply voltage and supply frequency, necessary conversion/correction device for supply shall be supplied along with the equipment.
- 4.11 Power supply system to all surveillance cameras shall have provision for receiving back-up power (POE) from an off-site switch in the event of total power cut-off in the complex.
- 4.12 All the control equipment's e.g. servers, NVR/ CAMERA SERVER etc. shall be provided in standard Racks.
- 4.13 All the cameras & control equipment, meant for installations, shall be suitable to work from (-) 10 degree C to (+) 50 degree C with RH up to 80% non-condensing. This temperature range may be achieved with or without heater.

## **5. SYSTEM REQUIREMENTS:**

- 5.1. IP Camera shall be used for image capture. All Cameras shall be Day/Night cameras.
- 5.2. All cameras shall be powered through UPS. Housing of cameras meant for use must be integrated by the camera manufacturer.
- 5.3. System must provide built-in facility of watermarking or Digital certificate to ensure tamperproof recording so that these can be used as evidence at a later date, if so desired.
- 5.4. All camera recordings shall have Camera ID & location/ area of recording as well as date/ time stamp. Camera ID, Location/ Area of recording & date/ time shall be programmable by the system administrator with User ID & Password.
- 5.5. Facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
- 5.6. Facility of Camera recording in CIF, 4 CIF, 720p as well as in any combination i.e. any camera can be recorded in any quality – Selective or Group of cameras must be available in the system.
- 5.7. System to have facility of additional camera installation beyond the originally planned capacity.
- 5.8. In order to optimize the memory, while recording, video shall be compressed using MPEG-4 or better standard and streamed over the IP network. Once on the network, video can be viewed on a Control room workstation shall be recorded on NVR/ CAMERA SERVER and shall be backed up on internal storage.
- 5.9. System shall be triplex i.e. it should provide facility of Viewing, Recording & Replay simultaneously.
- 5.10. The offered system shall have facility to export the desired portion of clipping (from a desired date/ time to another desired date/ time) on USB flash drives. Viewing of this recording shall be possible on standard PC using standard software.
- 5.11. Central Control Room will have NVR for Camera operation. For monitoring purposes, Video monitors shall be setup with suitable mounting arrangements, as per user requirements. Facility for viewing and controlling all the cameras at various other locations, as required, shall be provided.
- 5.12. There shall be a Control System with Video Control Software to manage all the video surveillance devices.
- 5.13. Video stream from individual cameras shall be recorded on respective NVR/ Camera Server & subsequently archived to internal backup device. System shall have provision to automatically overwrite the new information after the period of 30/31 days & necessary script/ algorithm must be available in the Application.

- 5.14. All the workstations in LAN should be provided with software to view and control the cameras, encoders and retrieve the recorded video images from the NVR/CAMERA SERVER/ NAS/ Raid backup device seamlessly.
- 5.15. The system should have automatic frame rate detection and recording facility. The system should have automatic (Actively Controlled Frame rate) frame rate recording feature; if the scene is inactive the video can be streamed at a much lower frame rate. As soon as the motion analysis software detects movement the video is streamed at full frame rate.
- 5.16. NVR shall keep track of all configurations & events. This will help in proper System administration & management etc.
- 5.17. The system should provide Camera fault and signal loss, etc. It shall facilitate with TFT on screen display to log all type of faults and alert alarms to the operator with date & time.

**6. TECHNICAL SPECIFICATIONS OF THE SUB-UNITS:**

**6.1. FULL HD NETWORK DOME IR CAMERA WITH VARIFOCAL LENS**

The product specified shall be indoor surveillance dome camera system. The camera system shall consist of an integrated 2 MP high resolution, CMOS camera, integrated IR and vari-focal lens.

| Parameter                | Description   |
|--------------------------|---|
| Scanning System          | Progressive   |
| Image Sensor             | 1/2.8" 2 Megapixel progressive scan CMOS  |
| Effective Pixels         | 1920 (H) x 1080 (V)   |
| Minimum Illumination     | 0.01Lux @ F1.4 (Color), 0 Lux @ F1.4 (IR LEDs on)   |
| IR LEDs                  | 850nm, 2 High Power LEDs  |
| IR Illumination Distance | 20m depending on scene reflectance, Smart IR  |
| S/N Ratio                | More than 50dB  |
| Gain Control             | Auto/ Manual  |
| Electronic Shutter Speed | Auto/ Manual, 1/3~1/10000s  |
| Lens Type                | 2.8 - 12mm , F1.4   |
| Horizontal Angle of View | 98.1° - 29.9°   |
| White Balance            | Auto/ Manual  |
| Day/Night                | Auto (ICR)/ Color / B&W   |
| Backlight Compensation   | BLC / HLC / DWDR  |
| Exposure Mode            | Manual/ Low noise/ Low motion blur/ Auto Ranges from 1/3 to 1/10000   |
| Noise Reduction          | 3D DNR  |
| Video Flip               | Support mirror function and flip function.  |
| Snapshot                 | Max 1f/s snapshot. File extension name is JPEG.   |
| Privacy Mask             | Supports 4 privacy mask zones (maximum)   |
| Video Setup              | Bright, contrast.   |
| Video Information        | Channel title, time title, motion detect, privacy mask.   |
| Motion Detection         | 396 (18 x 22) detection zones; sensitivity level ranges from 0 to 100; area threshold ranges from 0 to 100. Activation event: video storage, image snapshot, log, email function and etc. |
| Power Supply             | 12 V DC, or PoE IEEE 802.3af  |
| Power Consumption        | 4.5 W maximum   |
| Connectors               | Ethernet port RJ-45 10/100Base-T; 12 V DC   |
| Operational Temperature  | -30°C to +60°C  |
| Relative Humidity        | Less than or equal to 95%   |
| Impact Rating            | IK10  |
| Video Compression        | H.264/ MJPEG  |



|                           |  |
|---------------------------|--|
| Primary Stream Resolution | 1080p (1920x1080)/ 1.3M (1280x960)/ 720P (1280x720) / D1 (704x576 / 704x480) / CIF (352x288 / 352x240)                                       |
| Frame Rate                | Primary Stream: 1080p/ 1.3M / 720p / D1 @ 1~25/30 fps<br>Secondary Stream: D1/ CIF @ 1~25/30 fps   |
| Video Streaming           | Dual streaming: H.264/ MJPEG   |
| Video Bit Rate            | H.264: 1280 ~ 8192Kbps @ 1080p   |
| Security                  | Up to 20 users, multiple user access levels with password protection   |
| Supported Protocols       | IPv4/IPv6, HTTP, HTTPS, SSL, TCP/IP, UDP, UPnP, ICMP, IGMP, SNMP, RTSP, RTP, SMTP, NTP, DHCP, DNS, PPPOE, DDNS, FTP, IP Filter, QoS, Bonjour |
| Smart Phone               | IOS, Android   |
| Standards                 | ONVIF Profile S  |
| Emissions                 | FCC Part 15B, CE (EN 55022)  |
| Immunity                  | EN 50130-4   |
| Safety                    | EN 60950-1<br>UL/CSA 60950-1   |

## 6.2. FULL HD NETWORK DOME IR CAMERA WITH FIXED LENS

The product specified shall be indoor surveillance dome camera system. The camera system shall consist of an integrated 2 MP high resolution, CMOS camera, integrated IR and fixed lens.

| Parameter                 | Description  |
|---------------------------|--|
| Image Sensor              | 1/3" Megapixel progressive scan CMOS   |
| Effective Pixels          | 1920 (H) x 1080 (V)  |
| Minimum Illumination      | 0.5 Lux @ F1.6 (Color); 0 Lux @ F1.6   |
| Number of IR LEDs         | 27   |
| IR Beam Distance          | Max. 20m   |
| S/N Ratio                 | More than 50db   |
| Gain Control              | Auto / Manual  |
| Electronic Shutter Speed  | Auto/Manual (1/3~1/100000s)  |
| Lens Type                 | 3.6 mm Fixed, F1.6   |
| Horizontal Angle of View  | 88°  |
| Mount Type                | Board-in type  |
| White Balance             | Auto / Day / Night / Customized  |
| Day/Night                 | Auto (ICR) / Color / B&W   |
| Backlight Compensation    | BLC / DWDR   |
| Exposure Mode             | Manual / Low noise / Low motion blur / Auto<br>Ranges from 1/3 to 1/10000  |
| Noise Reduction           | 3D Noise Reduction   |
| Video Flip                | Mirror function and flip function  |
| Snapshot                  | Maximum 1 snapshot, saved as JPEG  |
| Privacy Mask              | 4 zones  |
| Video Setup               | Brightness and contrast  |
| Video Information         | Channel title; time title; motion detection; privacy mask  |
| Motion Detection          | 96 (18 x 22) detection zones; Sensitivity level ranges from 0 to 120; area threshold ranges from 0 to 120.<br>Activation event: video storage; image snapshot; log; email function |
| Watermark                 | Support  |
| Video Compression         | H.264 / MJPEG  |
| Primary Stream Resolution | 1080p (1920 x 1080) / SXGA (1280 x 1024) / 1.3M (1280 x 960) / 720p (1280 x 720) / D1 (704 x 576 / 704 x 480) / CIF (352 x 288 / 352 x 240)  |
| Frame Rate                | Main Stream: 1080p / SXGA / 1.3M / 720p / D1 @25/30fps<br>Sub Stream: D1 / CIF@25/30 fps   |

|                          |  |
|--------------------------|--|
| Video Bit Rate           | 1280K ~ 8192 Kbps @ 1080p  |
| Security                 | Up to 20 users, multiple user access levels with password protection   |
| Web Browser              | Microsoft Internet Explorer 6.0 or later; Mozilla Firefox®; Google Chrome; and Apple Safari  |
| Supported Protocols      | IPv4/IPv6, HTTP, HTTPS, SSL, TCP/IP, UDP, UPnP, ICMP, IGMP, SNMP, RTSP, RTP, SMTP, NTP, DHCP, DNS, PPPOE, DDNS, FTP, IP Filter, QoS, Bonjour |
| Smartphone Compatibility | iOS (iPhone® and iPad), Android  |
| Standards                | ONVIF Profile S  |
| Default Restoration      | Built-in reset button  |
| Power Supply             | 12 V DC PoE IEEE 802.3af, Type 1, Class 3  |
| Power Consumption        | Max. 6W  |
| Construction             | Housing: Die-cast aluminum and polycarbonate<br>Color: White   |
| Recording and Storage    | Network storage  |
| Connectors               | 1-channel wire Ethernet port; 10/100 Base-T Ethernet   |
| Operational Temperature  | -20°C to +60°C   |
| Working Humidity         | ≤ 95%  |
| Emissions                | FCC Part 15B, CE (EN 55022)  |
| Immunity                 | EN-50130-4   |
| Safety                   | UL/CSA 60950-1   |

### 6.3. JUNCTION BOX:

Junction box shall accommodate all the equipment required at the camera site. It shall withstand the high temperature environment. The provision for mounting the JB on the pole shall be made available in the junction box. It shall be vandal proof and weather proof so as to withstand the industrial environment and climate. The JB shall have a switch to switch the power supply from UPS. It shall accommodate the FO converter and other components of the system. All the equipment except the cameras shall be accommodated in the junction box, which is to be mounted on same pole. For terminating all cables the junction box should have suitable terminating block or connections. All the cables shall be clamped with suitable clamp to avoid the damage of the core/ conductors due to cables weight. Each junction box should be grounded to earth with suitable copper cable and earth pit made near the pole location. The earth pit making, earthing material required including the grounding wire shall be in scope of contractor. The earth pit shall be made as per the standard procedure being followed in GCF. The junction box shall be of IP 65 standards or better and vandal proof.

### 6.8 NETWORK VIDEO RECORDER:

#### 6.8.1 NVR & SOFTWARE

##### 6.8.1.1 HARDWARE SPECIFICATIONS

| ITEM                  | DESCRIPTION   |
|-----------------------|---|
| Operating System      | LINUX/Windows   |
| Processor             | High performance Dual-core embedded microprocessor                          |
| Video Input           | 32 channel @D1/ 16 channel @720P/ 8 channel @1080P/4 channel @ 3MP          |
| Compatible Protocol   | Support ONVIF   |
| Video Output          | 1HDMI(1920x1080,1280x1024),<br>1VGA(1920x1080,1280x1024),<br>1BNC (800x600) |
| Video Standard        | PAL or NTSC   |
| Compression           | H.264 / MJPEG   |
| Video Recording       | 32channels@D1/4CIF  |
| Multi-screen Channels | 1 and 4 Channels  |
| Audio Input           | The audio input with video. It requires that IPC supports audio input.      |
| Motion Detection      | It requires that IP Camera and Encoder support                              |

|                                 |   |
|---------------------------------|---|
|                                 | motion detection.   |
| Alarm Event                     | Recording, Alarm, Buzzer and Screen tips  |
| Alarm Input                     | 16 alarm inputs for local, network alarm from IP camera   |
| Alarm Output                    | 4 outputs   |
| Internal HDD                    | 8 SATA ports, 32TB storage supported  |
| Backup                          | Flash drive, USB HDD, Network download  |
| HDD Management                  | HDD faulty alarm  |
| Recording Mode                  | Manual, Schedule, Video Event trigger(Motion detection) ,Panic and Alarm trigger  |
| Search Mode                     | Date/Time, Event (Alarm, Motion detection), codec type search (accurate to second),Log link                             |
| Playback                        | 4 Channel simultaneous playback (forward / reverse, fast playback, slow playback, pause, full screen, backup selection) |
| Digital Zoom                    | Digital zoom in live view and playback  |
| Protocol Support                | HTTP,HTTPS, TCP/IP, RTSP,RTP/RTCP,UDP,NTP,DHCP,IPC search   |
| Remote Client Control Function  | Monitor, PTZ control, Playback, Configuration, File download, Log information, Alarm collect, Firmware Upgrade          |
| Concurrent User                 | Min 20, accessible over web, IOS, Android Mobile devices.   |
| Network Interface               | 2 RJ-45 port (10/100M/1000M) with Load Balancing Feature  |
| USB Interface                   | 3 USB2.0 ports  |
| Serial Interface                | 1 RS-232  |
| PTZ Control Interface           | 1 RS-485  |
| Power Input                     | 100~240 VAC 50~60Hz   |
| Power Consumption               | < 50W (without HDD)   |
| Operating Temperature           | -10°C ~ 55°C  |
| Relative Humidity               | 20% to 80%  |
| Dimensions                      | Standard 2U height,   |
| Web Client                      | Required  |
| Instant Playback                | Required  |
| Water Marking/Digital Signature | Required  |
| Certification                   | CE, FCC, CCC, MA  |

### 6.8.1.1 SOFTWARE SPECIFICATIONS

The NVR Application Software need to be installed in NVR as embedded for managing and monitoring the all the IP cameras in the network for hassle free operation. The software make should be same as that of the camera make.

#### 6.8.1.1.1 Main Features:

- 1 The NVR shall deliver 16-channel real-time recording at 720p resolution 25 FPS. The NVR must have 1080P HDMI video output, VGA output and BNC output.
- 2 The NVR shall support multicast for remote users.
- 3 Management shall be flexible. The NVR can either be used as standalone devices or perform as part of a larger system. When used independently, the NVR shall be interfaced with IP cameras via ONVIF to quickly and conveniently construct a high-definition IP surveillance system at multiple sites.
- 4 The NVR shall also be seamlessly integrated with smart IP security platform from same OEM. Operators can easily perform recording, live viewing, playback, configuration, PTZ control, video switch, and so forth.
- 5 The NVR shall support CMS software
- 6 NVR shall have below system performance as minimum;
  - Support log system.
  - Intelligent recording and alarm linkage upon the triggering of events

- Remote network camera set-up and image adjustment
- Automatic IP search and “one-click” IP camera import.
- Support Patrol live view.
- Support HDD hot swap.
- Support 8 SATA HDDs up to 32TB, 3 USB2.0
- Support ONVIF
- Support the IP cameras form same OEM
- Integration with security & surveillance management system from same OEM
- Support Web client Remote control.
- Support VMS viewer from VMS OEM.
- Support Dual Network
- 16 channel display on one single monitor
- Digital Water Mark
- Instant Playback
- Alarm trigger E-mail
- Defog & EIS
- Support Both IOS & Android App access

#### 6.8.1.2 Client Workstation for CMS

|                  |   |
|------------------|---|
| CPU              | Intel® Core™ i3 / i5 2.66 GHz or latest             |
| Memory           | 4GB / 8 GB or as required                           |
| Optical Drive    | DVD-RW  |
| HDD              | 1TB or as required                                  |
| Graphics Adapter | NVIDIA® 9200 or above, 1GB independent graphic card |
| OS               | Windows 10 Professional 64-bit                      |

#### 6.9 NETWORK COMPONENTS:

##### 6.9.1.1 Layer-2 8 / 16 / 24 port switch

##### 6.9.1.2 MEDIA CONVERTER:

- Single mode Fx to Tx convertor (The individual media convertors are required at camera end)
- Shall support a data rate of 100 Mbps copper to Fiber single mode upto a distance 1000 meters.
- The converter at camera end should be mountable on junction box and at switch and should be rack mountable.
- Auto negotiation
- Half and Full duplex operations
- Electrical port RJ45
- Optical Port – SC
- Shall be supplied along with the power supply.

**6.9.1.3 Media Convertor housing chassis** - At switch end the media converter should be housed in chassis as there will be more than one converter. The chassis should be able to house minimum of 8 media converter cords and should have in built AC to DC power supply.

##### 6.9.1.4 Layer-3 Switches

|                      |   |
|----------------------|---|
| Number of ports      | 24 Nos single mode 1000 base. Fiber LX duplex port module (16 ports) (to converge Fibre cable from Encode L2 Switches and existing Lan)<br>12 Nos 10/100/1000 base TX RJ 45 port to connect to L2 switch uplink and NVR box |
| Transmission Method  | Store and forward   |
| MAC Address Table    | 16 K entries per device   |
| Packet Buffer Memory | 16 Mbytes per device  |
| Power Supply         | AC 230 V @ 50 Hz  |

##### 6.9.1.5 POWER CABLE: Armoured:

|              |                      |
|--------------|----------------------|
| No. Of cores | 3                    |
| Voltage      | 1100 V               |
| Conductor    | Annealed Bare Copper |

|                            |   |
|----------------------------|---|
| Conductor diameter         | 2.5 sq. mm  |
| Conductor resistance       | 7.4 Ohm / KM  |
| No. of strands             | 7   |
| Diameter of strands        | 0.68 mm   |
| Insulation                 | PVC   |
| Insulation thickness       | 0.8mm   |
| Colour                     | RED, BLACK, GREEN   |
| Inner Sheath thickness     | 0.3mm FRLS PVC  |
| Outer sheath thickness     | 1.5mm   |
| Insulation resistance      | 100M ohm / KM @500V DC  |
| Armouring                  | GI  |
| Armouring thickness        | 1.4mm   |
| No. Of wires               | 20  |
| Metering                   | Input voltage, Battery voltage, Output voltage, Balance battery autonomy, Output frequency and load power (%) |
| By Pass :                  |   |
| Voltage tolerance          | 10% adjustable  |
| Transfer time              | Instantaneous   |
| PC interface Communication | RS 232  |
| User Interface             | Should be through means of a front panel consisting of LCD display and LED's for various functions            |

- 7 **The Camera Erection** - The camera dome should be mounted on top of the pole in such a way that the dome bottom surface is parallel to the ground surface. The top hole of pole should be aligned to cable entry points of camera dome. It is desired that camera erection to be done only in the end just before testing. The power and UTP cable from camera to junction box shall be done as per requirement.
- 8 **Testing** - The testing of the equipment and complete system shall commence only after erection of all equipment and completion of all cabling and earthing work. First the testing of all section of cabling and individual equipment shall be done and then only integrated testing shall commence.
- a. **Testing of Cameras** - After mounting the camera output shall be checked individually at junction box termination with the help of LCD TV/Laptop for clear visual output. The control junction shall be checked only in integrated mode.
- b. Testing of all other equipment like server, storage, video monitors, network video recorder shall be done in integrated testing mode.
- c. After completion of individual testing as mentioned above of different equipment and cable section all connections and connectorisation shall be done for integrated testing.
- d. In integrated testing following shall be observed:
- Video output of each camera on monitor of control room PCs.
  - The working on Network Video Recorder system.
  - The working of CMS software and demonstration of all its features to client.
  - The working of Recording storage and demonstration of all its features.
  - Searching of video history of particular camera.
- e. If any component, cable segment, software feature is not found working same shall be made functional by replacement / repair of that equipment / software.
- f. After completion of integrated testing and successful completion of it the test run shall be commenced which will last for 15 days in continuous operation round the clock. In the test run all important parameters shall be monitored and tabulated at regular interval and jointly signed by client and contractor representative. During the test run the complete system availability should be 100% including that of individual camera output. If the system availability is less than 100% for 15 days then the exercise shall be extended till we get 100% availability for continuous 15 days. Here availability means clear output from individual camera with PTZ control from control room monitor and functioning of Network Video Recorder system with all its functions.

- g. After completion of test run the trial run will start for 15 days during which the performance of system shall be monitored. Although performance data shall not be tabulated during this period but availability of all Cameras, Network Video Recorder, Client Software on terminals of client LAN should be 100%. In case these components are not available 100% then trial run shall be extended till availability of 100% is achieved for continuous 15 days. After this the system shall be accepted by client.
- h. After completion of trial run, the warranty period shall start which will be 36 months from date of completion of trial run and system acceptance by client.

**11. OTHER REQUIREMENTS: TECHNICAL MANUALS/ DOCUMENTATION:**

All manuals and documents shall be in English language and in such a way that a qualified engineer/ technician is able to fully understand and do the preventive as well as break down maintenance with the help of these manuals.

The contractor at the time of installation shall provide TWO complete sets of the following documents conforming to the proposed system: -

- a. Detailed specifications.
- b. Block diagram of the systems with brief descriptions.
- c. Schematic circuit diagram as also unit/ module wise diagram and stage-by-stage detailed description. The complete wiring details are also to be provided by the vendor.
- d. Data flow chart with data at different points during operations & testing.
- e. Component layout & position chart/ photograph for ease of locating the components.
- f. Servicing/Maintenance Instructions including preventive maintenance schedule. Indicate type of test equipment to be used for maintenance.
- g. Trouble shooting chart with proper test sequence, voltage and data at various test points.
- h. Detailed operation and technical manuals of all equipment and the system programming details.
- i. Original Licenses for all supplied software.

**12. TRAINING TO THE CLIENT PERSONNEL:**

- 1. On job training at site on all aspects of operation, programming and maintenance shall be provided by the contractor or his authorized representative to the concerned client officials / users for a period of at least 5 days during the warranty period.
- 2. Cost of all training has to be borne by the vendor.
- 3. Vendor has to agree for imparting the training as mentioned above and non-compliance of same by the vendor shall be liable for rejection of the vendor's bid.

**13. WARRANTY PERIOD:** The contractor shall guarantee that the system including units, assemblies, and sub-assemblies shall be free from any defects due to the defective material, bad workmanship and that the system shall not be less than the guaranteed values.

The guarantee shall be valid for a period of 36 months for the entire system from the date of successful completion of trial run and the system acceptance by client.

## **SUB HEAD M. TECHNICAL SPECIFICATION OF ACCESS CONTROL SYSTEM**

### **1. Access Controller:**

The control panel shall be compatible with Access Control software.

The control panel shall incorporate microprocessor-based, digital technology, using high speed processing for maximum reliability.

The system shall use distributed intelligence architecture, with control panels operating independently of one another.

All database information shall be stored at the control panel level.

All decision-making shall be performed at the control panel, eliminating degraded mode operation.

Proprietary software programs and control logic information used to coordinate and drive system hardware shall be stored in FLASH Memory.

The system shall be flexible and modular in design, allowing easy expansion.

The control panel shall have FCC, CE and C-TICK listings and approvals.

### **1.1 Control Panel Configuration**

The control panel shall provide TCP/ IP communication to the host software and RS-485 multi-drop communications to downstream panels.

The Ethernet and RS-485 multi-drop communication configurations shall be standard.

The control panel shall be able to operate in local and shall be able to connect with WIN-PAK for remote configurations.

The RS-485 multi-drop total distance shall be 4,000 feet with a maximum of thirty-one PRO3000 control panels, without the use of modems or line drivers. If installation requires distances longer than listed above, a line driver or modem shall be used.

For maximum reliability, each control panel shall support a maximum of two readers or keypads.

The distance between card readers and the control panel shall be up to 500 feet wired.

### **1.2 Control Panel Requirements**

#### **1.2.1 Reader Interface**

The panel shall provide interfaces for the card readers. It shall operate with card reader that produces a standard Wiegand (Data 1/Data 0) or Clock and Data communication output. The following requirements shall also apply:

- Each panel shall support two card readers, each of which may be up to 500 feet from the panel.
- Up to 128 unique card formats shall be supported.
- The panel shall support an integrated card reader/ keypad.

#### **1.2.2 Input Points**

A control panel shall provide maximum 8 supervised input points.

The control panel shall support non-supervised and supervised inputs via end-of-line resistors.

Supervised inputs shall report alarm, normal and trouble conditions. Both non-supervised and supervised input points shall be normally opened or closed point selectable.

#### **1.2.3 Output Points**

The control panel shall provide a minimum of four (4) single-pole, double-throw (SPDT) form C relays, rated for 28 VDC @ 3 Amp resistive.

#### **1.2.4 Card Readers/ Keypads**

The control panel shall support card readers using Wiegand technology.

### **1.3 Control Panel Features**

#### **1.3.1 Card/ Key code Capacity**

The control panel shall store up to 55,000 cards/key codes.

#### **1.3.2 Buffer Capability**

The control panel shall support a buffered mode of operation. When operating in the buffered mode, the control panel shall store all transactions in memory, rather than transmitting them through the communication loop. The control panel shall transmit the buffered (stored) information upon request.

The control panel shall buffer 45,000 transactions.

#### **1.3.3 Format Commands**

The control panel shall store up to 128 format (software) commands, allowing use of cards with various bit structures and encoding schemes.

#### **1.3.4 Site Codes**

The control panel shall store up to 8 site codes for card use.

#### **1.3.5 Cards (digits)**

The control panel shall be capable of recognizing card numbers up to 16 digits in lieu of the standard Wiegand card formats.

#### **1.3.6 Local Anti-Passback**

The control panel in the system shall support an anti-passback mode, where cardholders are required to follow a proper in/ out sequence. A selectable mode of operation to allow for anti-passback forgiveness to occur at midnight shall exist. When selected, at midnight all in/ out status of the card is set to a learn mode so the next use of the card will set the in/ out anti-passback rules until the next time forgiveness is applied.

#### **1.3.7 Global Anti-Passback**

Supported as a system function, Global Anti-Passback allows the panels on the same drop-line, so enabled, to provide other panels so enabled, the status of in/out card reads for the sake of creating an anti-passback zone using more than one control panel. This mode of system operation shall not rely on the system computer to control in/out status.

#### **1.3.8 Personal Identification Numbers (PINs)**

The control panel shall support the use of card readers in conjunction with keypads, in which users are required to enter a PIN, followed by a card, to gain access.

#### **1.3.9 Time Zones**

The control panel shall store up to 127 time zones:

- Each time zone shall include a start time, end time, day of week specification and holiday specification.
- Time zones may be assigned to cards via access levels to define when the card is allowed access.
- Time zones may be assigned to input points, to define when the input points are shunted (deactivated).
- Time zones may be assigned to output points (relays), to define when the output points are energized, for timed control of doors or devices.

#### **1.3.10 Input Points**

The user shall have the ability to assign shunt times to input points, from 1-63 seconds, minutes, or hours.

The user shall have the ability to assign debounce times to input points, from 1-255 seconds.

#### **1.3.11 Output Points**

The user shall have the ability to assign pulse times to output points, from 1-63 seconds, minutes, or hours.

#### **1.3.12 Interlocking**

The user shall have the ability to interlock selected input and output points, in any combination. An interlocked input or output point shall take action based upon a change of state from another input or output point.

#### **1.3.13 Holidays**

The control panel shall recognize up to 255 days as holidays, for override of normal system operation.

#### **1.3.14 Card Reader/ Keypad Specifications**

System card reader/ keypad shall be Wiegand card format.

#### **1.4 Power Requirements**

12 VDC @ 1.5 Amps

#### **2. Standard Proximity Card Readers with Wiegand Communication:**

The card readers with Wiegand Communications shall be provided with or without a keypad. The standard card reader must offer the following features:

- a. UL 294, Industry Canada RSS-210, and CE Certified
- b. Low Power/ Surface Mount Card Reader



- c. ADA compliant, built-in audible buzzer
- d. Host LED control and tamper output
- e. Hidden mounting screws deter vandalism
- f. LEDs for access and card reader status
- g. Wiegand output
- h. Potted for superior weather-resistance
- i. 5~16VDC Input Power
- j. Read Range: 10.2 cm
- k. Temperature Range: -31° C to 63° C
- l. Humidity: 0 - 95%, non-condensing
- m. Dimensions : 145mm H x 43mm W x 20mm D

**3. Finger Print with Proximity Reader**

|                       |   |
|-----------------------|---|
| CPU                   | 533MHz DSP  |
| Memory                | 8MB flash + 8MB RAM                                     |
| Fingerprint Sensor    | 500 dpi optical sensor                                  |
| Identification Speed  | 2,000 match in 1 second                                 |
| Fingerprint Capacity  | 10,000 templates (5,000 users, 2 fingerprints per user) |
| Log Capacity          | 50,000 events   |
| RF Card               | HID Proximity (125 KHz)                                 |
| Operation Mode        | Fingerprint, RF Card, RF card + Fingerprint             |
| Network Interface     | TCP/IP, RS485   |
| Wiegand               | Configurable up to 64 bits                              |
| Display               | Multi-color LED   |
| Audio                 | Multi-tone buzzer                                       |
| Power Supply          | 12V DC (Min. 500mA and above)                           |
| Operating Temperature | -20°C ~ 50°C  |
| Certification         | CE, RoHS  |

**4. Proximity Cards**

- a. The access card shall have ISO standard size and thickness.
- b. The access card shall be "Passive" (non-battery operated) proximity technology.
- c. The access card shall accept direct PVC printing of text, photos and graphics.
- d. The access card shall be slot punched on the short edge of the card for a vertical/ portrait oriented photo, shall be offered with multicolor custom graphics.
- e. The access card shall have an operating temperature of -45 to 70 degrees Celsius, and shall have an operating relative humidity of 5-95% non-condensing.
- f. The read range of the access card shall be extremely consistent, and not be affected by body shielding or variable environmental conditions

**5. Electro Magnet Lock**

- a. The electromagnetic lock shall operate on 12V DC/ 24V AC.
- b. The Electro Magnetic lock shall have capability of holding force up to 600 LBS on single leaf & double leaf door.
- c. UL certified

**6. Access Control Software**

The system equipment and installation shall comply with all provisions.

The basic components of the Security Access Control and Alarm Monitoring (SACAM) System shall include:

The Integrated Access Control System (ACS) shall function as an electronic access control system and shall integrate with alarm monitoring, ID badging and database management into a single platform.

The ACS shall be true 3-tier server client architecture. It shall consist of Database Server, Communication Server, and User Interface. These components shall run on a single computer or on multiple computers, allowing flexibility in configuring a networked system.

Multi-level Password Protection: The ACS application shall provide multi-level password protection, with user-defined operator name/ password combinations. Name/ password log-on shall restrict operators to selected areas of the program.

Supervised Alarm Points: The system shall provide both supervised and non-supervised alarm point monitoring.

Access Control Functions: The ACS shall include the following access control functions: validation based on time of day, day of week, holiday scheduling, site code and card number verification, automatic or manual retrieval of cardholder photographs, and access validation based on positive verification of card type (Standard), card, card and PIN, card or pin, pin only and Site Code only.

Anti-pass back modes shall include: hard (no forgiveness), soft (allows access but generates an alarm event)

Alarm Events: The ACS shall include a feature where alarm events with defined priorities shall be able to pop-up automatically in an Alarm event window for operator attention. The pop-up shall display the name of the event (reader, alarm point, cardholder, or system alarm), time, date, site, account, if a card event the card number, type of event and cardholder name. An event counter shall also display the number of times the event was reported to the Alarm event monitor prior to Acknowledgement or Clearing the event. Event instructions shall be made available by double clicking on the event. The Alarm event window shall allow the operator to initiate a physical response to the event as well as a written response. Responses shall include but not be limited to: acknowledge, clear, open a pre-programmed floor plan, energize, de-energize, pulse, time pulse, add comment, shunt, or un-shunt.

Shall support "Duress" feature, where a PIN is used in conjunction with a card read; the numbers of digits are selected using the keypad where the PIN number is a value different from the normal PIN.

Shall provide a mode of system operation that allows acknowledged alarms to be automatically cleared.

Shall provide a mode of system operation where when an acknowledged, but not cleared event will be reissued requiring acknowledgement when the event changes to an alarm or trouble state.

Shall support multiple card reader technology including: Proximity, Wiegand effect, Biometrics, Magnetic stripe, Bar Code, Keypad, Card/keypad (PIN), High-speed long range Vehicle ID, and Smart Card.

Shall provide the ability to initiate an email (via SMTP) or page to a paging system based on a transaction state/Event or Alarm.

Shall include a "host grant" mode of operation that requires the host computer to grant accesses to "valid" cards. An alternate host grant mode shall allow the card access information to be downloaded along with unlocking the door for "valid" cards.

## **7. Cards & Card Holders**

- A. Cardholder information shall include unique card number up to 20 digits and optional Personal Identification Number up to 6 digits.
- B. Shall allow multiple cards per cardholder. Every card can be assigned with 32 Access Levels.
- C. Provides special card options that shall include, but are not limited to: Time zone reference, which defines valid time, visitor use, which provides a specified activation date and expiration date (spanning

years), Trigger control value, which can initiate a predefined procedure at the intelligent control independent from any control function from the system computer.

- D. Shall provide a card "Trace" function. The Trace function shall allow normal access control, but will provide a tracking alarm at the system monitor.
- E. Shall provide the ability to store digital images of cardholder or other digital images such as property or family members.

#### **8. Access Levels**

- A. Access level shall provide restricted access to the card holders for various areas in the access control system based on various Time of the day, week, and special days and Location/ Door.
- B. ACS shall support defining of unrestricted number of access levels and any number of doors/ readers can be added in one access level.
- C. ACS shall support custom Access Level where by Access can be granted or revoked for a specific door only.

#### **9. Reports**

- A. Shall provide a feature to generate a history report for an alarm point(s) state. An alarm point state shall be defined as Normal, Alarm, Trouble, or Ajar, Communication, ground fault, power, panel reset, low voltage, panel tamper, and loop communication.
- B. Shall provide a feature to generate a Device actions report, which provides information on how the system Device is configured including detailed configurations.
- C. Shall provide a feature to generate a history report for a card(s) state. A card state shall be defined as Normal, Trace, and Not Found, Anti-Pass back Violation, PIN Violation, Time Zone Violation, Site Code Violation, or Expired card. Additional search criteria shall include cardholders that meet up to at least 3-note field restriction and filter the report with defined reader location(s).
- D. Shall provide complete database reporting of all data programmed into the system data files.
- E. Shall provide feature to generate a report based on the frequency of usage of a card. The report shall allow the operator to define a time/ date period, a minimum and maximum usage limit, a means to define which reader or readers should be used to filter the report and the ability to further define the type of card to be reported on based on user defined field selections. This report shall also provide a disposition function. The cards meeting the filtering criteria shall be acted upon based on the disposition setting. Disposition settings shall include but not be limited to: Report only, De-activate the card or Re-assign to a specified an access level. This report shall be available in the event scheduler. When defining when to run the report an option to select the number of previous days to run the report against shall be provided. As an example a scheduled weekly report for the last 14 days could generate allowing for an overlap of time if desired.

#### **10. Tracking/ Muster Report**

- A. A tracking feature shall allow the system operator to identify an area and the person(s) in that area.
- B. Areas shall be defined by readers representing an IN or OUT read status.
- C. Defined areas shall provide an automatic update of how many cardholders are in the area.
- D. A view displaying all card holders in a defined tracking or muster area shall have the ability to be sorted in columns where by clicking on the column the data in the column shall be sorted. At a minimum, the columns can be sorted by: Card Number, Status, Card Holder, Reader, and Time/ Date.
- E. A Muster area shall be defined by a reader(s) used to "muster" individuals in the event of an emergency.
- F. Reports shall be generated for all muster or tracking areas in the system.

- G. Tracking areas shall include “nested” areas. Nesting allows for various reports from a large area to smaller areas within the large area.
- H. A Tracking and Muster area screen shall be continually updated with the most recent card activity, therefore minimizing the time required generating a report.

**10. 3rd Party interface**

The System shall have an existing standard API for integration with other 3rd party applications.

Alarms/ Events can be exported to 3rd party application if required with the help of these API.

Card Holder enrollment and de enrollment can be done from a 3rd part application with the help of these API (OPTIONAL).

## **SUB HEAD N: LIFTS**

### **(I) SPECIAL CONDITIONS OF CONTRACT (S.C.C.) - LIFTS**

#### **1. GENERAL:**

The Special Conditions of Contract are an extension of and are to be read in conjunction with the General Conditions of Contract. Should there be any contradictory requirements in the two, the requirement as per the Special Conditions of Contract shall prevail.

#### **2. DRAWINGS:**

- i. Contract/ Tender Drawings duly signed by the Architect/ Client are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the direction of the Project Manager and with the prior approval of the Project Manager.
- ii. Architectural drawings shall take precedence over Structural drawings, which in turn shall take precedence over services drawings in regard to all dimensions.
- iii. The Contractor shall verify all dimensions at the Site and bring to the notice of the Project Manager discrepancies if any, the Project Manager's decision in this respect shall be final.

#### **3. WORK TO BE CARRIED OUT BY LICENSED PERSONS/ FIRMS:**

Technically competent persons or firms holding valid licenses shall only carry out any special service installations included in the scope of the Work.

#### **4. INSPECTION AND TESTING OF MATERIALS:**

The Contractor shall, if so required, produce manufacturers' test certificates for any particular batch of materials supplied by him. The tests carried out shall be as per relevant Indian Standards and shall be carried out at Government approved test facility specified by the Project Manager.

For checking setting out and testing materials at the Site the Contractor shall provide the following minimum testing equipment:

- i. Theodolites
- ii. Automatic levels
- iii. Steel tapes
- iv. Weighing machines
- v. Spirit levels, plumb bobs
- vi. Micro meters
- vii. Thermometers
- viii. Hydraulic testing machines
- ix. Smoke test machines
- x. Complete concrete testing lab equipment
- xi. Moisture meters
- xii. Complete sets of sieves
- xiii. Oven.
- xiv. Specialist equipment required for doing the works with quality & as per specifications.

All such equipment shall be calibrated at specified frequency for accuracy at a Testing Facility approved by the Project Manager and calibration certificates will be submitted to the Project Manager.

#### **5. REFERENCE DRAWINGS:**

The Contractor shall maintain on site one set of all Drawings issued to him for reference.

#### **6. SHOP DRAWINGS:**

- 6.1 The Contractor shall submit, during the currency of the project, to the Project Manager four (4) copies of all shop drawings for his approval.

- 6.2 All the shop drawings shall be prepared on computer through AutoCAD software. Within 7 days after the issue of award of the contract and initial set of working drawings, the contractor shall furnish to the Project Manager, for the approval of the Architect/ Consultant, four sets of detailed shop drawings of all equipment and materials as required by the Architect/ Project Manager.
- Each item of equipment/ material proposed shall be a standard catalogue product of an established manufacturer strictly from the List of Approved Makes and Manufacturers.
- 6.3 Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any materials to allow Architect/ Client ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.
- 6.4 Manufacturers drawings, catalogues, pamphlets, equipment characteristics data, performance charts and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labeled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.
- 6.5 Samples of all finishing materials other than materials so specified shall be submitted to the Project Manager prior to procurement. These will be submitted in triplicate for approval and retention by Project Manager and Architect and shall be kept in their site office for reference and verification till the completion of the Project.
- 6.6 Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contractor.
- 6.7 Where the contractor proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, piping, wiring or any other part of the mechanical, electrical or architectural layouts; he shall inform the Project Manager well in advance and no delays resulting from such re-design shall be admissible. He shall also submit all related information as may be required for such redesign to the Architect/ Project Manager.
- 6.8 Where the work of the contractor has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Project Manager, the contractor shall prepare composite working drawings and sections at a suitable scale not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the Owner/ Project Manager.
- 6.9 Within four weeks of approval of all the relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement, and itemized price list of recommended (by manufacturers) imported and local spare parts and tools covering all equipment and materials in this contract. The Project Manager shall make recommendation to Owner for acceptance of anticipated variation in contract amounts and also advise the Owner to initiate action for procurement of spare parts and tools at the completion of project.

**7. COMPLETION DRAWINGS & STANDARD MEASUREMENT BOOK (SMB):**

On completion of the Work, the Contractor shall submit three (3) complete sets of the site produced drawings and marked up prints of "AS BUILT" drawings verified and approved by the Architect to the Project Manager. These drawings shall include and show all the changes/ deviations made from the working drawings during the course of construction and also the other details as called for by the Project Manager. During the execution of the Works a set of drawings shall be retained in the Contractor's Site Offices for the exclusive purpose of recording changes made to the Work as the construction proceeds.

The drawings shall be prepared on computer through AutoCAD Software and provided to the Project Manager on CD.

Along with the completion drawings the Contractor shall also prepare and submit to the Project Manager the Standard Measurement Book (SMB) in the form of a bound book and a soft copy of the same. SMB shall incorporate the standard measurements of the items as per the completion/ as built drawings in modules finalized in consultation with the Project Manager.

**8. TESTING OF INSTALLATIONS:**

The Contractor shall also perform all such tests as may be necessary and required by the Project Manager to ensure quality of the executed works and by local authorities to meet Municipal and other by-laws, regulations in force. The Contractor shall provide all labour, equipment, and materials etc., required for the performance of the tests.

**9. SITE INFORMATION:**

All information, levels and dimensions given in the tender drawings relating to Site conditions are given in good faith; the Contractor shall, however, make his own independent inquiries and verify the same. Any claims for extras on account of any deviations or incorrectness of above referred information, levels etc., shall be considered as inadmissible.

The Contractor shall obtain all information relating to local regulations, by-laws and all regulations applicable to the work or applicable profession. Any claims in this regard shall be inadmissible.

**10. SITE INSTRUCTION FILE:**

The Contractor shall maintain a Site instruction file at the Site office. All instructions received from the Project Manager relating to the Work shall be retained in the file.

**11. PHOTOGRAPHS:**

Besides submitting progress charts, reports, etc., the Contractor shall submit progress photographs as directed by Project Manager, every four weeks in triplicate along with negatives.

**12. PROFESSIONAL INTEGRITY AND TEAM SPIRIT:**

It is the intent of the Owner and the Project Manager that this Project will be executed in a spirit of teamwork and full professional integrity. The Contractor shall fully co-operate with all agencies concerned to fulfill this objective.

**13. QUALITY ASSURANCE AND CONTROL PROGRAMME:**

The Contractor shall establish an effective quality control system at the Site and implement the same through an independent team consisting of the Contractor's Representative and qualified and experienced engineers and technical personnel to enforce quality control on all items of the Work and the Project at all stages. **Quality Assurance Manual shall be submitted with Technical bid.**

**14. CONTRACT DRAWINGS:**

Drawings forming part of the Contract are listed in Annexure B. Further supplementary Drawings furnished by the Project Manager from time to time shall also be deemed to form part of the Contract.

**15. ENTRY TO THE SITE:**

The Project Manager, at his discretion has the right to issue passes to control the admission of the Contractor, his agents, employees and work people to the Site of the Work or any part thereof. Passes shall be returned at any time on demand by the Project Manager.

**16. FIRE PRECAUTIONS:**

The Contractor shall take all precautions and preventive measures against fire hazards at the Site and shall assume full responsibility for the same.

**17. PERFORMANCE BOND:**

The Contractor shall furnish a performance bond in the form of a bank guarantee from a scheduled bank approved by the Project Manager, for the value and validity as mentioned in the Schedule of Fiscal Aspects, within Ten (10) days from the date of LOI/ or before signing the agreement of contract. The Bank Guarantee shall be in the approved format.

**18. DRILLING, CUTTING ETC.:**

All cutting and drilling of walls or other elements of the building for the proper entry/ installation of inserts, boxes, equipment, etc. shall be carried out using electrically operated tools only. Manual drilling, cutting, chiseling, etc. shall not be permitted. No structural member shall be cut or chased without the written permission of the Project Manager. Cutting and drilling of structural members shall be carried out using vibration free diamond wire sawing and diamond drilling only with prior permission from the Project Manager. The costs for procurement and using such equipment are deemed to be included in the Contract and no extra costs will be paid.

**19. APPROVAL BY STATUTORY BODIES:**

The Project Manager will handle commencement Certificate, No Objection Certificate and Occupation Certificate if applicable for the permanent building works under this Contract.

The contractor shall be responsible for providing required notices to authorities and to obtain and retain with him at his own cost all other approvals from the statutory bodies pertaining to works under this tender and temporary structures to be constructed at site, labour, ESI, PF, Tax Deptts. etc. and any other approval required to facilitate performance of Contractor's work under the Contract till completion.

Refusal by statutory authorities to issue completion/ occupation certificate or any other approvals due to the Contractor's failure to construct the building in accordance with the sanctioned plans and/or specifications shall render the Contractor liable for damages and in addition, render him liable to obtain such certificates at his cost.

**20. LABOUR WAGES:**

The Contractor shall have no claim whatsoever, if on account of any rules and regulations or otherwise, he is required to pay wages in excess of fair wages called for under Clause 12.2 of General Conditions.

**21. TESTING FACILITIES AT SITE:**

21.1 The Contractor shall provide facilities/ equipment to test the quality of material being used.

21.2 The Contractor shall get other tests carried out at his own cost at approved laboratory as per the directions of the Project Manager.

**22. REPORTS & CHECKLISTS BY CONTRACTOR:**

22.1 Contractor has to note that Project Manager follows the ISO procedures and all reports, returns & checklists shall conform to ISO standards & procedures as informed to the Contractor by the Project Manager for time to time. Within 15 days of award of contract the contractor shall submit the draft formats for various reports and Checklists for the approval of the Project Manager. During progress of the Work the Contractor shall prepare and submit to the Project Manager various checklists, for having checked various Works at different stages of progress and reports as per the approved formats and at specified frequency.

22.2 The Contractor shall file daily category-wise labour return. The report shall indicate scheduled requirement against actual strength.

22.2 The Contractor shall prepare weekly reports of planned and actual progress of the Work and the subsequent week's scheduled Work. These will also include material procurement status. These reports shall be submitted to Project Manager and Owner's Representative and shall be reviewed in weekly co-ordination meeting.

22.3 The Contractor shall submit monthly report along with monthly bills.

22.4 Further progress charts and schedules shall be prepared by the Contractor as directed by the Project Manager.

22.5 Contractor shall submit a safety procedure manual or Company policy on safety. Complying with the SHE Plan and outlining its implementation by the Contractor and including:



- i. Quality Assurance and Control System (Sample format).
- ii. Realistic construction programme/ schedule.

22.6 Contractor shall maintain and make available all the records pertaining to reports, returns and checklist to the Project Manager during audits (internal as well as external) and make necessary corrections, additions and actions based upon the findings/ observations of the audits.

**23. NAME BOARD AND PUBLICITY:**

The contractor is not entitled to do any publicity on account of the project. Contractor shall not put any hoarding, publish any advertisement, put any banner or circulate any pamphlet or adopt any other publicity method save and except with prior written approval of the Project Manager.

A name board may be made and displayed by the Contractor at his own cost at the Site at some approved place. The drawing of the Name Board shall be got approved from the Project Manager. The contents of the board shall be as follows:-

- i. Name of the Project.
- ii. Name of the Owner/Owners.
- iii. Project Manager/ Architect/ Consultants with their addresses.
- iv. Contracting Agency.
- v. Other Contracting Agencies.

Care should be taken to see that the height of letters especially for the Architects should not be more than 2" to abide by the code of professional conduct prescribed by the Indian Institute Of Architects. The colour, texture etc., of the board shall be as per the Architect's instructions.

**24. SITE BARRICADING:**

Site Boundary wall existing at site shall be maintained by the Contractor at his own cost till completion of the Project. However if it is required from the Contractor to replace/ rectify the existing fencing/ boundary wall for security purpose the same shall be done at Contractor's own cost subject to approval of design from the Project Manager. Contractor for safety reason provide the GI sheet barricading around the excavated pits and his work area, which shall be put in proper line and level and shall be painted as per the instructions of the Project Manager. Contractor shall at his own cost provide lockable gates at all the openings in the site barricading, boundary wall, access roads that may be required from time to time during progress of work. Contractor shall be required to provide appropriate barricading within the site to ensure safety of men and material, at his own cost.

**25. RATE ONLY ITEMS, NON-TENDERED/ EXTRA ITEMS AND QUANTITIES EXCEEDING THE TENDERED QUANTITIES:**

**The contractor shall immediately and before procurement and execution of the work obtain a written approval of the variation order from the Project Manager for the rate only item, non-tendered/ extra items and quantities exceeding the tendered quantities. No payments will be entertained without the Project Manager's written approval of the change/ variation order.** The onus shall be on the Contractor to obtain such prior written variation order from the Project Manager.

**26. WATER AND ELECTRICITY:**

Contractor shall make his own arrangement for water & electricity for construction purposes. Contractor will be provided water & electricity for construction purposes on chargeable basis at one location within the site premises.

26.1 Contractor shall be responsible for all connections, pumps, pipes, storage facilities and all other things necessary to distribute and use services from this distribution point.

26.2 Electricity will be provided to the contractor at one point within the site premises on chargeable basis. Further electricity distribution required for Construction Work shall be the responsibility of the Contractor in all respects. Contractor shall be responsible for all distribution points as may be required for the Work. The Contractor shall also make arrangement for alternative standby services at his own cost in the form of additional Generators of adequate capacity (day & night) so that there is no delay in progress of Work as per construction schedule submitted by him and approved by the Project

Manager. The point of supply shall be at Generator/ Electric supply Board. The cost of energy meter shall be borne by the allied contractor.

26.3 The Contractor shall prepare schematic distribution diagrams of distribution of electricity and water for construction purposes incorporating all safeties and get them approved by the Project Manager, the distribution at site shall be in accordance to the approved schematic. The contractor shall ensure incorporation and strict implementation of all safety parameters, equipments, instruments and directions given by the Project Manager from time to time in this regard.

26.4 The contractor shall install the temporary distribution lines for water and electricity ensuring that work of other agencies/ vendors is not interrupted or hampered. In case during the course of construction these lines foul or interrupt or hamper the work of other agencies/ vendors, the contractor shall remove and relocate the service lines and relocate the same at his own cost with in the time stipulated by the Project Manager.

All statutory Fees, & miscellaneous expenses and costs for electric power and Water connection for construction purposes shall be borne by the Contractor. However Client shall reimburse all statutory deposits, if any, on productions of receipts.

**27. ASSOCIATED CIVIL WORKS:**

All civil works required for the storage of materials or the installation of equipments any other required for the contractor's functioning shall be the responsibility of the contractor.

**28. GUARANTEE TO PERFORM:**

The contractor shall carry out the work in accordance with the drawings, specifications, schedule and other documents forming part of the contract.

The contractor shall be fully responsible for the performance of the works executed by him. The guarantees on the approved format shall be submitted to the Project Manager along with the as-built documentation at the end of the project. These guarantees will be executed & extended by the contractor and not by the sub agencies to the Project Manager.

**29. POWER REQUIREMENT:**

The contractor shall submit with their tender, their requirement of power for each of their equipment along with the number of equipment proposed for use at site.

**30. ESCALATION:**

**No escalation on Contract price/ rates shall be applicable during the tenancy of the Contract period including extensions thereof.**

**31. DEWATERING AND FLOODING CONTROL:**

The Contractor is deemed to have allowed for any and all temporary dewatering, during the execution of his Work. Such work shall include but not necessarily be limited to the safe disposal of the resulting water; removal, replacement and/or recompaction of the water logged soils/ surfaces; backfilling plugging of all temporary sumps, ditches, temporary materials and devices.

Contractor shall be deemed to have allowed for all costs associated with removal of flood waters and any associated sludge debris etc. from the basement level or any other part of the building so effected in the event of flooding due to heavy rains during his construction activities and after basement, superstructure work is completed until such time as Contractor has completed and handed over all his works under the Contract.

**32. BOUNDARY WALLS:**

Contractor shall protect and preserve existing boundary walls and fencings whether or not they are eventually to remain or to be removed or replaced.

Any removal of such boundaries shall be done in a planned way, with prior notification to, and approval of, the Project Manager. Any replacement boundary walls/ fences, etc. shall be built as soon after or concurrent with the removal, where this is practical and expedient such that site integrity be maintained in so far as it is practical.

Contractor is deemed to have allowed for all cost associated with any/ all removal and replacement, where required, of all boundary walls. The materials of the existing boundary walls and fencings shall remain the property of the Owner/ Project Manager and Contractor shall ensure to hand over the same in good condition to the Project Manager on completion of Project/ removal of the same.

### **33. PROTECTION/ PRESERVATION OF TREES:**

Contractor shall take all measures necessary to ensure the protection and preservation of existing trees within/ outside the boundary of the site. Contractor shall be responsible of any damage/ casualty to the trees happening as a result of his working at site and for any action, claim, penalty or expenses imposed by the forest/ any other department. No claim/ payment shall be payable to the contractor on this account.

## **(II) TECHNICAL SPECIFICATIONS - LIFTS**

### **1.0 GENERAL:**

These specifications are intended to cover the complete installation of the elevator plant in the first class work men like manner and include all work and material as specified. The supply and installation of Elevators are on turnkey basis. Any item not mentioned in the detailed specifications but required to be provided stands included in the contract amount and nothing extra shall be payable for that.

The Scope of works cover Supply, Installation, Testing and Commissioning of elevators as per BOQ & Specifications complete with Obtaining Necessary Approvals and license of operate from appropriate local authority.

#### **The work shall conform to:**

IS: 1860-1980 (R1996) : Code of practice of installation, operation and maintenance of electrical passenger & goods lifts.  
IS: 4666-1986 : Specifications for Electric passenger and goods lifts.

In addition the relevant clauses of the following, as amended upto date shall apply.

### **2.0 STANDARDS:**

The following BIS Standards and Codes of Practice with upto date amendments shall apply to the equipment and the work covered by this contract.

Electric Traction Lifts – Guide line for outline dimensions IS 14665 (Part-1) – 2000  
Electric Traction Lifts – Code of practice for installation IS 14665 (Part-2) – 2000  
Electric Traction Lifts – Safety Rules IS 14665 (Part-3) – 2000  
Electric Traction Lifts – Components IS 14665 (Part-4) – 2000  
Code of practice for electrical wiring installations (system voltage not exceeding 650 volts) IS 732:1963

In addition the relevant clauses of the following, as amended upto date shall apply.

- The Indian Electricity Rules 1956
- The Indian Electricity Act 1910
- Bombay Lift Act 1939
- Local Estate Lift Act
- Fire Safety regulations pertaining to elevators
- National Building Code of India NBC – 2016
- **All Elevators shall be with ADA Compliance (like Leveling, Braille & Raised characters, properly located car & hall controls, Audible signals, Door opening time & door protection and Emergency communication etc)**

The tenderers shall also take into account local and State regulations as in vogue for the design and installation of Elevators.

Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable. BIS certified equipment shall be used as a part of the Contract.

### **3.0 DRIVING MECHANISM:**

#### **3.1 Elevator Machine:**

The elevator machine shall be suitable for 415 volts, 3 phase, 50 Hz AC supply with a voltage variation of +10% and -20%.

The elevator machine shall have high efficiency and low power consumption and shall be designed to withstand peak currents in elevator duties. Resilient anti-vibration mountings of suitable design shall be provided to minimize vibration transmission to the building structure.

Gearless machine, variable voltage, variable frequency with microprocessor technology and shall be machine room less. The technology shall be compact permanent magnet machine technology. Micro-processor based modular control system with micro-processor controllers. Controllers & safety devices shall be able to perform trouble free on both raw power & DG power, as no UPS power shall be made available for Elevator operation and controls.

### **4.0 CONTROL:**

The elevators shall have state of art microprocessor based variable voltage variable frequency (VVVF) drive. Group Supervisory Control also called Simplex/ Duplex/ Triplex (as required) Selective Collective Group Control for Elevators. The control system shall regulate dispatching of individual cars and shall provide service to all floors as different traffic conditions arise minimizing unproductive factors. The system shall respond automatically to UP and DOWN peak, balanced or light traffic etc. Complete detail of these features shall be furnished along with the tender. Some of the technical parameters required are innumerate below. Tenderers shall categorically confirm their compliance or otherwise in the tender.

|  |   |  |
|--|---|--|
| a) Starting Current  | - | 1.2 – 1.5 time full load running current |
| b) Power saving  | - | 50 – 55%                                 |
| c) Leveling accuracy   | - | ± 3 mm                                   |
| d) Acceptable Voltage Fluctuation  | - | + 10 to -20%                             |
| e) Rate of acceleration/ deceleration (M/S <sup>2</sup> )                                  | - | 0.6 – 1.5 (Adjustable at site)           |
| f) Maximum jerk (M/S <sup>3</sup> )  | - | 0.7 – 1.5 (Adjustable at site)           |
| g) Maximum vibration in car horizontal/ vertical   | - | 20/18 dBA                                |
| h) Maximum noise level in car during travel  | - | 48 dBA                                   |
| i) Maximum noise level in machine room at 1 mtr from machine (NA)                          | - | 62 dBA                                   |
| j) Maximum door noise level while closing and Opening at a distance of 1 mtr from car door | - | 52 dBA                                   |

The controller shall be wall/ floor mounted, vertical, totally enclosed cubicle type with hinged doors on the front and the rear to provide easy access to all components in the controller. The cubicle shall be well ventilated such that the temperature inside never exceeds the safe limits of the components at ambient room conditions.

The controller shall operate within the supply voltage variation of plus 10% to minus 20% of the nominal voltage. An inbuilt voltage stabilizer shall be provided in the controller for the purpose.

The controller shall be complete with relay protection against the following:

- a) Over current
- b) Under voltage
- c) Single phasing
- d) Phase reversal
- e) Earth leakage
- f) Over voltage

g) And as required as per latest codes

The controller shall be designed to cut off the power supply, apply the brake and bring the car to a rest in the event of any of the above failures occurring.

Controller shall have all operations to be software controlled with following facilities:

- a) Provide I/O points for Fire alarm control to shut down the elevator in the event of fire.
- b) Provide monitoring points for:
  - i. Elevator position.
  - ii. Emergency Stop.

The controller shall operate within the supply voltage fluctuations specified and shall incorporate necessary input voltage stabilisers. The system shall have proven reliability.

In the case of machine roomless elevators the controller should be located such that it can be easily accessed from the last landing and shall be key locked and vandal proof.

The tenderer shall state clearly the form of protection provided for each equipment.

If any devices of the electro mechanical type are used the same shall be equipped with arc chutes to prolong the life of contacts. Tenderers shall stipulate the type of devices used and the material of the contacts.

Tenderer shall support their offers with complete details of experience, number of elevators installed and operational in India, collaboration for equipment design and manufacture etc.

## **5.0 CAR ENCLOSURE:**

The elevator car enclosure including car door, hoistway doors and return panel shall be with stainless steel Hairline finish OR as mentioned in BOQ. Height of enclosure shall be as per BOQ. Owners to provide floor finish of their choice. The weight to be allowed for flooring shall be as per BOQ for passenger elevator. The enclosure shall have fixtures and fittings including provision of car ventilation as detailed in technical parameters. Safety railing shall also be provided. The car enclosure shall also have:

- 5.1 Control panel in car & landing to have switches with Braille marking.
- 5.2 Do's & Don't & Emergency instruction embossed on a SS plate to be displayed at a proper height/location.

## **6.0 DOORS:**

### **6.1 Car Door:**

The car entrances for elevators shall be automatic power operated, center opening, horizontal sliding doors. Car doors shall be fire rated as per fire department requirement.

### **6.2 Hoistway Landing Doors:**

The hoistway landings for elevators shall be automatic power operated, center opening door. The landing doors shall be fire rated as per fire department requirement.

### **6.3 Car & Hoistway Door Protection:**

A multiple infrared cell electronic door Sensor shall be provided to regulate the closing motion of the doors for entry of the passengers. When a person is entering the car while the doors are closing the Sensor shall sense the same and hold the doors to permit entry.

### **6.4 Car & Hoistway Door Operation:**

The equipment shall be complete with electric door operator for opening and closing of Car & Hoistway landing door. The equipment shall consist of a motor on the elevator car to operate the door when the car is stopping at a landing. The car & hoistway doors shall be mechanically connected such that both move simultaneously for opening and closing.

The hoistway landing door shall be provided with an interlock such that.

- a) It shall not be possible for the car to be started or kept in motion until all the landing doors and the car door are locked in the closed position.
- b) It shall not be possible to open the landing door from the landing unless the elevator car is within the particular landing zone.
- c) The car doors & hoistway landing doors open automatically as the car is stopping at a landing. The closing of the car and landing door must occur before the car is set in motion.

#### **6.5 Door Hangers and Tracks:**

The car and the landing doors shall be provided with two point suspension sheave type hangers complete with tracks. Sheaves and rollers shall be steel with moulded nylon collar and shall include shielded ball bearings. Tracks shall be of suitable steel section with smooth surface. The landing doors shall be complete with headers, sills, frames etc. as required.

#### **7.0 CABIN FAN:**

A Noiseless pressure fan or blower shall be provided in the elevator cabin with supply grill matching with the interior of the car.

#### **8.0 EMERGENCY LIGHTS:**

In addition to normal fluorescent lighting, an emergency light unit LED type using sealed Nickel/ Cadmium Maintenance free battery power pack with charger to operate automatically and to illuminate the car for minimum 30 minutes in case of power failure shall be provided in each elevator car.

#### **9.0 AUTOMATIC RESCUE DEVICE (ARD):**

Each elevator shall be provided with an electronic state of art Emergency Battery Drive for automatically rescuing trap passengers from the elevator during power failure. The rescue device shall automatically bring the elevator car to the nearest landing and open the door so that the trapped persons can walk out of the elevators. The elevators shall resume normal operation on restoration of power supply. Batteries shall be sealed maintenance free.

The capacity of battery shall be such that minimum two up & down movements are met.

#### **10.0 OPERATION BUTTONS AND INDICATIONS:**

The following operation buttons and indications shall be provided:

##### **10.1 In each Elevator Car:**

Stainless steel panel of suitable thickness flush mounted shall be provided on one side of the door having:

- LED Illuminated push buttons of micro pressure type corresponding to the floors served.
- Door open and door close button.
- Emergency stop button.
- Emergency alarm button.
- Two position key operated switch for 'with attendant' and 'without attendant' operation.
- Ventilation fan ON/ OFF switch with auto OFF when there is no call after 120 seconds.
- Built in intercom of the hands free type as well as space for providing EPABX telephone instrument and 5 pair telephone trailing cable to communicate from car to reception desk at ground floor.
- Dynamic car direction display
- Car position indicator
- Audio/ Visual overload warning indicator and floor indication.
- Digital car temperature indicator
- Digital voice synthesizer for announcing special messages with background music shall be quoted as an optional extra item.
- Stainless steel side Hand rail/ Grab bar

- Digital floor indication display.
- **All buttons shall have “Braille” marking**

Note: Emergency call system shall be wired to the ground floor reception desk.

## 10.2 At Landings:

### Terminal Landings

- LED illuminated type single push buttons with travel indication arrow in satin finish stainless steel facia plate.
- Digital car position indicator with gong in stainless steel facia plate.
- Audio/ Visual floor indication.
- **All buttons shall have “Braille” marking**

### Intermediate Landings

- Two LED illuminated type push buttons with travel indication arrow in satin finish stainless steel facia plate.
- Digital car position indicator with gong in stainless steel facia plate.
- **All buttons shall have “Braille” marking**

## 11.0 SAFETY DEVICES:

All safety devices statutorily required by Elevator Inspector, including but not restricted to the following shall be provided (ARD is required):

### 11.1 Terminal and Final Limits:

Terminal limit switches shall be provided to slow down and stop the car automatically at the terminal landings, and final limit switches shall be furnished to automatically cut off power should the car travel beyond the terminal landings.

### 11.2 Interlocking:

Adequate interlocking is to be provided so that the car shall not move if the landing doors are even partially open and also the elevator is overloaded.

### 11.3 Car Safety and Governor:

The car safety shall be provided to stop the car whenever excessive descending speed is attained (OSG is required).

### 11.4 Emergency Stop Switches:

An emergency stop switch for use by maintenance personal shall be provided in each elevator car.

### 11.5 Self Leveling:

The elevators shall be provided with self leveling features of  $\pm 3$ mm accuracy.

## 12.0 FIREMAN SWITCH:

Each Elevator shall have a Fireman switch with glass front for access by the Fireman. The operation of this switch shall cancel all calls to this elevator and will stop at the next nearest landing if traveling upwards. The doors will not open at this landing and the elevator will return to the ground floor. In case the elevator is traveling downwards when the fireman's switch is operated it will go straight to the ground floor bypassing all calls enroute. The emergency stop button inside the car shall be rendered inoperative.

## 13.0 GUIDE RAILS:

The car rails should be 'TEE' section, duly machined, tongued and grooved. Counter weight rails shall be 'TEE' section, duly machined, tongued and grooved. The guide rails shall have sections, the properties of which shall comply with the requirement of the relevant IS code. The guides shall be capable of withstanding forces resulting from the application of the car or counter weight safety devices.

**14.0 BUFFERS:**

The suitable heavy duty spring buffers shall be placed below the car and counter weight but in the pit & arranged to sustain any shock, should the Elevator over travel past the terminal limits. Buffers shall be mounted on RCC foundation blocks. Dowels for the purpose shall be left while casting the pit floor alternatively floor reinforcement could be exposed by chipping for welding additional reinforcement for dowels.

**15.0 ROPES:**

These will be self-lubricated; round standard steel wire ropes manufactured from high grade steel and special flexible material and shall conform to the relevant Indian Standards. The number and size of the hoistway ropes shall be so selected that it have the combined breaking strength calculated with a minimum factor of safety of 10 times the combined weight of car with full load and also have adequate traction for the elevator. The governor ropes shall also be wire ropes.

**16.0 SILLS:**

The sills to be provided should be aluminium grooved, with self-supporting sill M.S. angle of adequate size.

**17.0 AC MOTOR:**

The make, type and capacity of hoisting motors should be mentioned. The motor should be suitable for elevator service (S4 duty) with high starting torque & low starting current. Thermistor shall be embedded in starter windings to indicate the temperature rise in the motor.

**18.0 ELECTRIC POWER:**

The available system of electric supply is 415 Volts +10% -10% between phases and 240 Volts between phase and neutral – 3 phase, 4 wire AC 50 Hz system. In addition, for illumination and control, power at 240 volts AC single phase 50 Hz shall also be available. Any equipment/ component operating at other than the above mentioned power supply shall be provided with necessary transformers/ voltage stabilizers. The amount of power required for elevators shall be indicated in the tender. Power shall be provided at one point in each Machine Room at a point to be indicated by the tenderer. All subsequent electrical systems shall be the responsibility of the tenderer.

**19.0 ALARM BELL:**

A butterfly operated emergency alarm bell, including wiring to be provided and connected to a properly marked push button in the car operating panel. The alarm bell shall be located at the ground floor, at the floor landing outside and adjacent to hoistway or as desired by Project Manager.

The alarm unit shall be solid-state siren type, operated by Nickel/ Cadmium maintenance free chargeable batteries to give a waxing and warning siren when the alarm button in the car is pressed momentarily.

**20.0 COUNTER WEIGHT:**

The counter weight shall be made of cast iron and consist of structural steel frame which shall travel between rigid guides and also shall be capable of withstanding buffer impacts. The counter weight shall have weight equal to that of the complete elevator car and approximately 50% of the contact load. Suitable metallic counter weight guard of required length shall be provided at the bottom of the hoistway.

**21.0 HITCHES PLATES:**

Self aligning hitches plates of better roping shall be provided.

**22.0 TRAVELING CABLES:**

Fire proof compound coated traveling cable shall be used and shall conform to IS: 4289 - 1967 with latest amendment. The firm can also use flat traveling cables (imported only) with the approval of the consultant.

**23.0 GUIDE RAILS SHOES:**

To prevent car shaking automatic adjustable guide rails shoes should be used. The firm should use Teflon guide ribs on lubricated guide rails.



**24.0 REVERSE PHASE RELAY:**

Reverse phase relays should be provided on the controller which should be designed to protect the Elevator equipment against phase reversal and single phasing and phase failure.

**25.0 CONTROLLER:**

Single automatic push button control shall be used. The design of the controller should be such that it can be mounted on a wall and is dust protected, providing sufficient protection against lizards, rodents etc.

**26.0 TECHNICAL PARAMETERS:**

Following Technical Parameters give requirement of various parameters of passenger elevators. Tenderers shall fill in their item wise confirmation/ comments in the column provided for the purpose in this annexure. Deviations, if any, from tender requirements shall be clearly brought out in this annexure, failing which it shall be presumed that the offer conforms to the tender requirements fully. Tenders in whom these technical parameters are not duly filled in by the tenderers are liable to be summarily rejected.

**27.0 CENTRAL ELEVATOR MONITORING PANEL:**

A BMS Compatible central elevator monitoring panel shall be provided in the Reception Area or any other place designated wherever specified.

The central Monitoring Panel shall minimally show the following:

- a) Position of all cars.
- b) Direction of travel of each car.
- c) Elevator stuck.
- d) Elevator on emergency.
- e) Voice connection to all elevators.

The panel should be hardwired from each elevator machine room.

**28.0 ERECTION:**

- a) The elevator contractor should furnish detailed drawings showing their requirements of cutouts, holes and beams, before the machine room floor is cast. In case no such details become available, the machine room floor will be cast and all such openings shall be made by the Elevator contractor at his own cost.
- b) All structural steel required for mounting the machinery, controllers etc. should form part of elevator suppliers scope of work. This includes all supporting beams, hoisting beam etc. All minor builder's work shall also be included in the scope of work and this shall include chasing of floors, walls, fixing of hoistway brackets etc. Safe scaffolding shall be provided by the elevator vendor as required for the erection and for providing necessary lighting in the hoistway.
- c) Elevator machine shall be mounted on suitable vibration isolation pads to prevent machine vibration being transmitted to the structure.
- d) All wiring inside the machine room shall be neatly done in conduit or wire race. The elevator machine, motor alternator, controller and the car shall be double earthed will be brought to the main panel. Suitable guards for counter weights and deflectors shall be provided.
- e) Entire installation shall conform to the requirements of Local Lift Inspectorate and necessary approvals shall be obtained from the statutory authorities for the use of the elevator.
- f) All exposed elevator metal work shall be given one shop coat of paint and one field coat after installation, testing and commissioning.

**29.0 TESTING & COMMISSIONING:**

The Elevators shall be tested & commissioned in the presence of owner's nominated representative. The testing and commissioning shall be done as per relevant IS codes. The arrangement of dead load, various measuring & monitoring instruments shall be arranged by the vendor at its own cost.

The pre-commissioning checks shall among others consist of the following:

- a) Insulation resistance testing of drive motors and alternator with 1000V meggar.
- b) Insulation resistance testing of cabling and wiring.
- c) Proving tests on various interlocks and safety devices.

All results of the pre-commissioning checks shall be recorded and four copies submitted to the consultants.

A contract load test under the supervision of the local authority and in the presence of Architect/Consultant shall be carried out before each elevator is put in regular service. During the test, the brakes, limit switches buffers, car safety devices shall be caused to function with the contract load in the elevator and the operation of various safety devices shall be recorded.

The levelling gear shall be tested on-load and off-load to ensure car levelling within limits.

The elevator must be tested for contract speed with the full contract load.

The emergency landing facility shall be tested for all the elevators and test results recorded.

The elevator shall be accepted upon satisfactory completion of the above tests

## TECHNICAL PARAMATERS

### 30.0 a. Passenger Elevator (With Machine Room)

| Sl. No. | ms  | Requirement as per Tender       | Item wise confirmation/<br>comment to be filled in by Tenderers |
|---------|---|---------------------------------|---|
| 1       | Type & Location   | Passenger Elevator              |   |
| 2       | Capacity :  |                                 |   |
|         | a) No. of Passengers  | Please refer BOQ                |   |
|         | b) Load   | Please refer BOQ                |   |
| 3       | Speed   | Please refer BOQ                |   |
| 4       | Floor Designation   | Please refer BOQ                |   |
| 5       | No. of stops  | Please refer BOQ                |   |
| 6       | No. of openings   | Please refer BOQ                |   |
| 7       | Opening position  | All openings on front side      |   |
| 8       | Elevator Shaft  | Please refer BOQ                |   |
| 9       | Car   |                                 |   |
|         | a) Size   | (As/ vendor)                    |   |
| 10      | Travel Height   | Please refer BOQ                |   |
| 11      | Car Entrance  |                                 |   |
|         | a) size   | As per vendor                   |   |
| 12      | Landing Entrance  |                                 |   |
|         | a) size   | As per vendor                   |   |
| 13      | Pit depth   | As/ vendor & as/ NBC            |   |
| 14      | Over Head room above last landing   | As/ vendor                      |   |
| 15      | Machine room  | Machine Room less               |   |
| 16      | Operation   | Directional Collective Control  |   |
| 17      | Position of counter weight  | To be furnished by the Tenderer |   |
| 18      | Machine Parameters  |                                 |   |
| 19      | Make of motor   | To be furnished by the Tenderer |   |
| 20      | Type of machine   | VVVF Drive control              |   |
| 21      | Reduction gear ratio  | To be furnished by the Tenderer |   |
| 22      | Motor power in HP/ kW   | To be furnished by the Tenderer |   |
| 23      | Starting/ Full load current   | To be furnished by the Tenderer |   |
| 24      | Starts per hour permissible with permissible temperature rise over the ambient  | To be furnished by the Tenderer |   |
| 25      | Motor insulation class  | To be furnished by the Tenderer |   |
| 26      | Hoist/ Governor ropes (No. & size)  | To be furnished by the Tenderer |   |
| 27      | Guaranteed leveling accuracy  | Within + 3mm                    |   |
| 28      | Rate of acceleration/ deceleration (m/sec <sup>2</sup> )                        | To be furnished by the Tenderer |   |
| 29      | Jerk (m/ sec <sup>2</sup> )   | To be furnished by the Tenderer |   |
| 30      | Vibrations in car – horizontal/ vertical  | To be furnished by the Tenderer |   |
| 31      | Noise level during travel in car  | To be furnished by the Tenderer |   |
| 32      | Noise level in machine room at 1 mtr from machine                               | To be furnished by the Tenderer |   |
| 33      | Door noise level while closing and opening at a distance of 1 mtr from car door | To be furnished by the Tenderer |   |

**Note: Vendor shall submit the detail traffic analysis along with the tender document.**

**30.0 a. Passenger Elevator (Machine Room Less)**

| Sl. No. | ms  | Requirement as per Tender       | Item wise confirmation/ comment to be filled in by Tenderers |
|---------|---|---------------------------------|--|
| 1       | Type & Location   | Passenger Elevator              |  |
| 2       | Capacity :  |                                 |  |
|         | a) No. of Passengers  | Please refer BOQ                |  |
|         | b) Load   | Please refer BOQ                |  |
| 3       | Speed   | Please refer BOQ                |  |
| 4       | Floor Designation   | Please refer BOQ                |  |
| 5       | No. of stops  | Please refer BOQ                |  |
| 6       | No. of openings   | Please refer BOQ                |  |
| 7       | Opening position  | All openings on front side      |  |
| 8       | Elevator Shaft  | Please refer BOQ                |  |
| 9       | Car   |                                 |  |
|         | a) Size   | (As/ vendor)                    |  |
| 10      | Travel Height   | Please refer BOQ                |  |
| 11      | Car Entrance  |                                 |  |
|         | a) size   | As per vendor                   |  |
| 12      | Landing Entrance  |                                 |  |
|         | a) size   | As per vendor                   |  |
| 13      | Pit depth   | As/ vendor & as/ NBC            |  |
| 14      | Over Head room above last landing   | As/ vendor                      |  |
| 15      | Machine room  | Machine Room less               |  |
| 16      | Operation   | Directional Collective Control  |  |
| 17      | Position of counter weight  | To be furnished by the Tenderer |  |
| 18      | Machine Parameters  |                                 |  |
| 19      | Make of motor   | To be furnished by the Tenderer |  |
| 20      | Type of machine   | VVVF Drive control              |  |
| 21      | Reduction gear ratio  | To be furnished by the Tenderer |  |
| 22      | Motor power in HP/ kW   | To be furnished by the Tenderer |  |
| 23      | Starting/ Full load current   | To be furnished by the Tenderer |  |
| 24      | Starts per hour permissible with permissible temperature rise over the ambient  | To be furnished by the Tenderer |  |
| 25      | Motor insulation class  | To be furnished by the Tenderer |  |
| 26      | Hoist/ Governor ropes (No. & size)  | To be furnished by the Tenderer |  |
| 27      | Guaranteed leveling accuracy  | Within $\pm 3$ mm               |  |
| 28      | Rate of acceleration/ deceleration (m/sec <sup>2</sup> )                        | To be furnished by the Tenderer |  |
| 29      | Jerk (m/ sec <sup>2</sup> )   | To be furnished by the Tenderer |  |
| 30      | Vibrations in car – horizontal/ vertical  | To be furnished by the Tenderer |  |
| 31      | Noise level during travel in car  | To be furnished by the Tenderer |  |
| 32      | Noise level in machine room at 1 mtr from machine                               | To be furnished by the Tenderer |  |
| 33      | Door noise level while closing and opening at a distance of 1 mtr from car door | To be furnished by the Tenderer |  |

**Note: Vendor shall submit the detail traffic analysis along with the tender document.**

**31.0 b. Service Elevator**

| Sl. No. | ms  | Requirement as per Tender       | Item wise confirmation/<br>comment to be filled in by Tenderers |
|---------|---|---------------------------------|---|
| 1       | Type & Location   | Service Elevator                |   |
| 2       | Capacity :  | Please refer BOQ                |   |
|         | a) No. of Passengers  | Please refer BOQ                |   |
|         | b) Load   | Please refer BOQ                |   |
| 3       | Speed   | Please refer BOQ                |   |
| 4       | Floor Designation   | Please refer BOQ                |   |
| 5       | No. of stops  | Please refer BOQ                |   |
| 6       | No. of openings   | Please refer BOQ                |   |
| 7       | Opening position  | Only front openings             |   |
| 8       | Elevator Shaft  | Please refer BOQ                |   |
| 9       | Car   |                                 |   |
|         | a) Size   | (As/ vendor)                    |   |
| 10      | Travel Height   | Please refer BOQ                |   |
| 11      | Car Entrance  |                                 |   |
|         | a) size   | As per vendor                   |   |
| 12      | Landing Entrance  |                                 |   |
|         | a) size   | As per vendor                   |   |
| 13      | Pit depth   | As/ vendor & as/ NBC            |   |
| 14      | Over Head room above last landing   | As/ vendor                      |   |
| 15      | Machine room  | Machine Room less               |   |
| 16      | Operation   | Directional Collective Control  |   |
| 17      | Position of counter weight  | To be furnished by the Tenderer |   |
| 18      | Machine Parameters  |                                 |   |
| 19      | Make of motor   | To be furnished by the Tenderer |   |
| 20      | Type of machine   | VVVF Drive control              |   |
| 21      | Reduction gear ratio  | To be furnished by the Tenderer |   |
| 22      | Motor power in HP/ kW   | To be furnished by the Tenderer |   |
| 23      | Starting/ Full load current   | To be furnished by the Tenderer |   |
| 24      | Starts per hour permissible with permissible temperature rise over the ambient  | To be furnished by the Tenderer |   |
| 25      | Motor insulation class  | To be furnished by the Tenderer |   |
| 26      | Hoist/ Governor ropes (No. & size)  | To be furnished by the Tenderer |   |
| 27      | Guaranteed leveling accuracy  | Within $\pm 3$ mm               |   |
| 28      | Rate of acceleration/ deceleration (m/sec <sup>2</sup> )                        | To be furnished by the Tenderer |   |
| 29      | Jerk (m/ sec <sup>2</sup> )   | To be furnished by the Tenderer |   |
| 30      | Vibrations in car – horizontal/ vertical  | To be furnished by the Tenderer |   |
| 31      | Noise level during travel in car  | To be furnished by the Tenderer |   |
| 32      | Noise level in machine room at 1 mtr from machine                               | To be furnished by the Tenderer |   |
| 33      | Door noise level while closing and opening at a distance of 1 mtr from car door | To be furnished by the Tenderer |   |

**Note: Vendor shall submit the detail traffic analysis along with the tender document.**

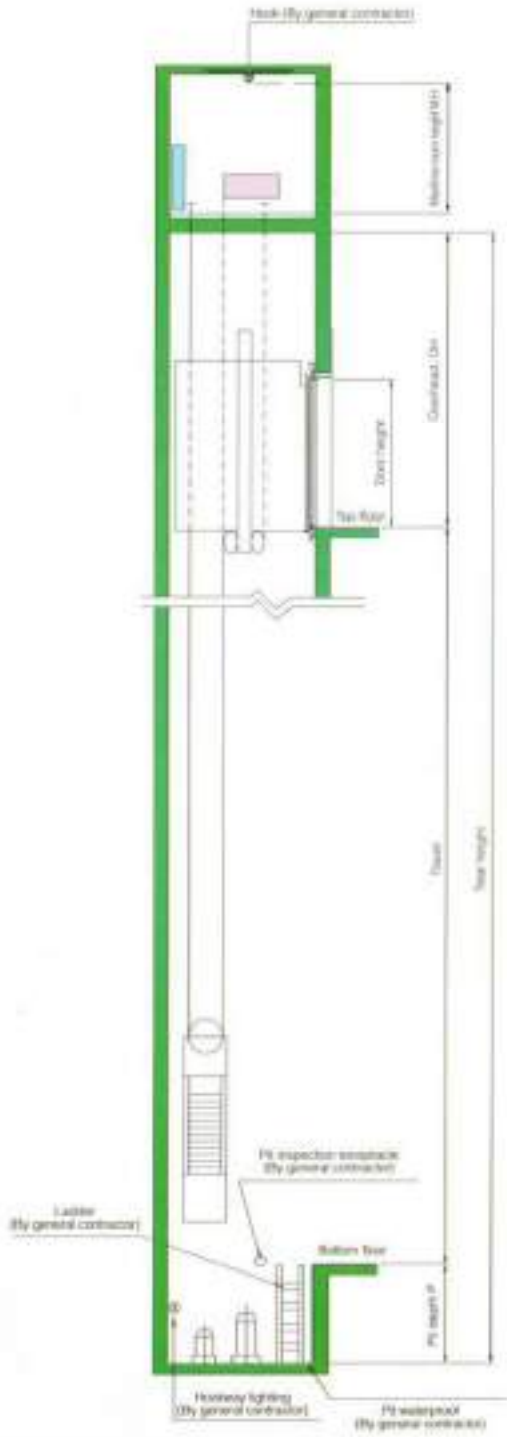
32. COMMON FEATURES FOR ALL ELEVATORS:

| Sl. No | Items                                    | Requirement as per Tender  | Item wise confirmation/<br>comment to be filled in by Tenderers |
|--------|--|--|---|
| 1      | <b>Car</b>                               |  |   |
|        | <b>a) Décor</b>                          |  |   |
|        | i) Wall panels                           | As per BOQ   |   |
|        | ii) Ceiling                              | As per BOQ   |   |
|        | iii) Flooring                            | As per BOQ   |   |
|        | iv) Illumination                         | Fluorescent/ CFL Indirect lighting   |   |
|        | v) Hand rail                             | Stainless Steel Hairline finish  |   |
|        | <b>b) Special Features</b>               |  |   |
|        | i) Ventilation - Cabin fan               | Pressure fan suitably concealed behind the false ceiling to throw air evenly   |   |
|        | ii) Emergency Light & Alarm bell         | With SMF battery operated with charger rated for 30 minute.  |   |
|        | iii) Fireman's Switch                    | To be provided at GF/ Lobby level  |   |
| 2      | <b>Car Entrance</b>                      |  |   |
|        | a) Opening position                      | Same side, centre opening  |   |
|        | b) Type of door                          | Automatic door with multiple Infrared cell detector  |   |
|        | c) Door Panels                           | As per BOQ   |   |
| 3      | <b>Landing Entrance</b>                  |  |   |
|        | a) Opening                               | Centre opening   |   |
|        | b) Type of door                          | Automatic door with multiple Infrared cell detector  |   |
|        | c) Door Panels                           | As per BOQ   |   |
| 4      | <b>Control</b>                           | A.C. Variable Voltage Variable Frequency (ACVVVF)  |   |
| 5      | <b>Type of Signal System</b>             |  |   |
|        | a) Indicators in the Car                 | 1. Digital position indicator with directional arrows in car and at every floors.<br>2. Car direction indicator<br>3. Luminous buttons for each floor in car operating panel.<br>4. Maintenance Free Battery operated alarm bell & emergency light.<br>5. Fireman's switch for each Elevator as per fire laws  |   |
| 6      | <b>Ventilation</b>                       | Pressure fan suitably concealed behind the false ceiling to throw air evenly   |   |
| 7      | <b>Machine</b>                           |  |   |
|        | Power Supply                             | 415V/ 240V, 50 Hz  |   |
|        | Acceptable voltage fluctuation           | +10 to -10%  |   |
| 8      | <b>Operating buttons and indications</b> | Stainless steel panel of suitable thickness flush mounted shall be provided on both side of passenger Elevator and one side for service Elevator. the door having :  |   |
|        |  | 1. LED illuminated push buttons of micro pressure type corresponding to the floors served.<br>2. Door open and door close button<br>3. Emergency stop button.<br>4. Emergency alarm button.<br>5. Two position key operated switch for 'with attendant' and 'without attendant' operation<br>6. Ventilation fan ON/OFF switch with auto OFF when there is no call after 120 seconds<br>7. Built in intercom of the hands free type as well as space for providing EPABX telephone instrument and 5 pair telephone trailing cable to communicate from |   |

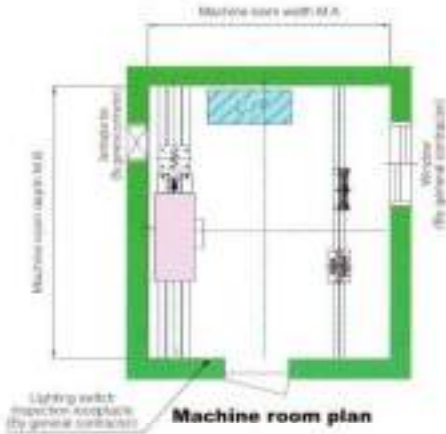
| Sl. No | Items  | Requirement as per Tender   | Item wise confirmation/ comment to be filled in by Tenderers |
|--------|--|---|--|
|        |  | machine room receiver and car to Central Monitoring Station ( at remote location) and vice-versa.   |  |
|        |  | 8. Dynamic car direction display  |  |
|        |  | 9. Car position indicator   |  |
|        |  | 10. Audio/Visual overload warning indicator   |  |
|        |  | 11. Digital car temperature indicator   |  |
|        |  | 12. Digital Voice synthesizer for announcing special messages with background music shall be quoted as an optional extra item   |  |
|        |  |   |  |
| 9      | <b>Safety features</b>   |   |  |
|        | a) Door safety   | Multiple infra-red cell detectors   |  |
|        | b) Guaranteed Governor tripping  | 140%  |  |
|        | c) Buffer  | Spring buffer to be provided  |  |
|        | d) Over load protection  | ➤ Over load protective device with audible alarm<br>➤ Over load non starter   |  |
|        | e) Over travel protection  | Terminal and final limit switches to be provided.   |  |
|        | f) Motor protection  | Trip devices for -<br>➤ Over current<br>➤ Under voltage<br>➤ Over voltage<br>➤ Single phasing<br>➤ Earth leakage<br>➤ Phase reversal  |  |
|        | g) Interlocking of car & hoist way doors   | To be provided as per specifications  |  |
|        |  |   |  |
| 10     | <b>Landing signals</b>   |   |  |
|        | a) Hall buttons  | Self-illuminating micro-push type in hair line stainless steel fascia plates  |  |
|        | b) Car position  | Digital indicator with direction of travel  |  |
| 11     | Intercom System  | Yes – to be provided  |  |
| 12     | Interface with Fire Alarm System to Stop Elevator at the nearest Floor and “Open Doors & keep them Open” | Yes – to be provided  |  |
| 13     | Auto Rescue Device   | Yes – in case of emergency, Elevator should reach to the nearest landing  |  |
| 14     | Free Comprehensive Maintenance Period  | 18 months after final virtual completion of work and handing over of the Elevators in satisfactory operating condition along with necessary approval (statutory or otherwise) to operate the elevators. |  |
| 15     | Cost of obtaining statutory approval including Elevator Inspector's clearance                            | Tenderers to confirm including the cost in the quoted rate.   |  |
| 16     | Cost of organizing 4 weeks trial operation after commissioning and Elevator Inspectors clearance         | Tenderers to confirm including the cost in the quoted rate.   |  |
| 17     | Music  | To be quoted as optional extra  |  |
| 18     | Voice synthesizer  | To be quoted as optional extra  |  |

Following details for reference:

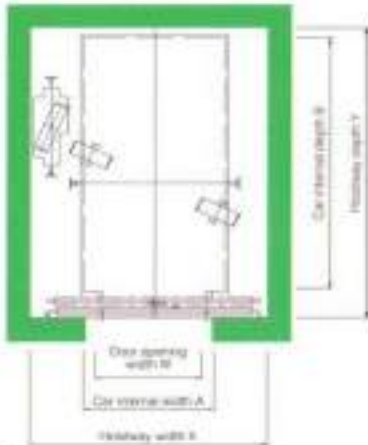
# Hoistway Layout



**Hoistway section**



**Machine room plan**



**Hoistway plan (D)**



**Hoistway plan (D2)**



| Type      | No. of Person | Capacity (kg) | Speed (m/s) | Door size (HxW) (mm) | Door width (mm) | Hoistway width (mm) |           |           | Machine room dimensions (mm) |           | Hoistway depth (mm) | Max. Service load (kg) | Max. Travel (m) |           |           |      |           |
|-----------|---------------|---------------|-------------|----------------------|-----------------|---------------------|-----------|-----------|------------------------------|-----------|---------------------|------------------------|-----------------|-----------|-----------|------|-----------|
|           |               |               |             |                      |                 | OH                  | OH        | P         | MxHxW                        | NxH       |                     |                        |                 |           |           |      |           |
| P14-CO180 | W             | 14            | 852         | 3                    | 1800x1400       | CO 900              | 2400x1820 | 5250      | 2900                         | 2400x1820 | 2300                | 18                     | 48              | 150       |           |      |           |
|           |               |               |             |                      |                 | CO 1000             | 2450x1820 |           |                              | 2450x1820 |                     |                        |                 |           |           |      |           |
|           |               |               |             |                      |                 | CO 1150             | 2600x1820 |           |                              | 2600x1820 |                     |                        |                 |           |           |      |           |
| P17-CO60  | W             | 17            | 1158        | 1800x1500            | -               | CO 900              | 2600x1840 | 4200      | 1300                         | 2600x1840 | 2300                | 7.0                    | 48              | 90        |           |      |           |
| CO 1150   | 2650x1840     |               |             |                      |                 | 2650x1840           |           |           |                              |           |                     |                        |                 |           |           |      |           |
| P17-CO96  | W             |               |             |                      |                 | 1.6                 | CO 1000   | 2600x1840 | 4350                         | 1400      |                     |                        |                 |           | 2600x1840 | 12   | 100       |
|           |               |               |             |                      |                 | CO 1150             | 2650x1840 | 2650x1840 |                              |           |                     |                        |                 |           |           |      |           |
| P17-CO105 | W             |               |             |                      |                 | 1.75                | CO 1000   | 2600x1840 | 4400                         | 1450      |                     |                        |                 |           | 2600x1840 | 12   | 100       |
|           |               |               |             |                      |                 | CO 1150             | 2650x1840 | 2650x1840 |                              |           |                     |                        |                 |           |           |      |           |
| P17-CO120 | W             |               |             |                      |                 | 2                   | CO 1000   | 2600x1840 | 4500                         | 1600      |                     |                        |                 |           | 2600x1840 | 14   | 150       |
|           |               |               |             |                      |                 | CO 1150             | 2600x1840 | 2650x1840 |                              |           |                     |                        |                 |           |           |      |           |
| P17-CO150 | W             | 2.5           | CO 1000     | 2600x1840            | 4800            | 2000                | 2600x1840 | 16        | 150                          |           |                     |                        |                 |           |           |      |           |
|           |               | CO 1150       | 2650x1840   | 2650x1840            |                 |                     |           |           |                              |           |                     |                        |                 |           |           |      |           |
| P17-CO180 | W             | 3             | CO 1000     | 2800x1840            | 5250            | 2500                | 2800x1840 | 20        | 150                          |           |                     |                        |                 |           |           |      |           |
|           |               |               |             |                      |                 |                     | 2650x1840 |           |                              |           |                     |                        |                 |           |           |      |           |
| P18-2560  | D             | 18            | 1224        | 1200x2300            | -               | 25 1100             | 2030x2710 | 4200      | 1300                         | 2030x2710 | 2300                | 48                     | 48              | 90        |           |      |           |
| P18-2596  | D             |               |             |                      |                 | 1.6                 | 25 1100   |           |                              | 2030x2710 |                     |                        |                 |           | 4350      | 1400 | 2030x2710 |
| P18-25105 | D             |               |             |                      |                 | 1.75                | 25 1100   | 2030x2710 | 4400                         | 1450      |                     |                        |                 |           | 2030x2710 | 14   | 100       |
|           |               |               |             |                      |                 | 2                   | 25 1500   | 2030x2710 |                              |           |                     |                        |                 |           | 4500      |      |           |
| P18-25120 | D             |               |             |                      |                 | 2.5                 | 25 1500   | 2030x2710 | 4800                         | 2000      |                     |                        |                 |           | 2030x2710 | 16   | 150       |
| P18-25150 | D             |               |             |                      |                 | 3                   | 25 1500   | 2030x2710 | 5250                         | 2500      |                     |                        |                 |           | 2030x2710 | 20   | 150       |
| P18-25180 | D             |               |             |                      |                 |                     |           |           |                              |           |                     |                        |                 |           | 2030x2710 |      |           |
| P22-2560  | D             |               |             |                      |                 | 22                  | 1496      | 1800x2400 | -                            | 25 1200   |                     |                        |                 |           | 2230x2810 | 4200 | 1300      |
| P22-2596  | D             | 1.6           | 25 1200     | 2230x2810            | 4350            |                     |           |           |                              | 1400      | 2230x2810           | 16                     | 100             |           |           |      |           |
|           |               | 1.75          | 25 1200     | 2230x2810            |                 |                     |           |           |                              |           | 4400                |                        |                 | 1450      | 2230x2810 | 16   | 100       |
| P22-25105 | D             | 2             | 25 1200     | 2230x2810            | 4500            |                     |           |           |                              | 1600      |                     | 2230x2810              | 20              |           | 150       |      |           |
|           |               | 2.5           | 25 1200     | 2230x2810            |                 |                     |           |           |                              |           | 4800                | 2000                   |                 | 2230x2810 |           | 24   | 150       |
| P22-25150 | D             | 3             | 25 1200     | 2230x2810            | 5250            |                     |           |           |                              | 2500      |                     |                        | 2230x2810       | 28        | 150       |      |           |
| P22-25180 | D             |               |             |                      |                 |                     |           |           |                              |           | 2230x2810           |                        |                 |           |           |      |           |
| P17-2596  | D2            | 17            | 1158        | 1200x2200            | -               |                     |           |           |                              | 25 1100   | 2030x2870           | 4200                   | 1300            | 2030x2870 | 2300      | 48   | 48        |
| P17-25105 | D2            |               |             |                      |                 | 1.6                 | 25 1100   | 2030x2870 | 4350                         | 1400      | 2030x2870           |                        |                 | 12        |           |      |           |
|           |               |               |             |                      |                 | 1.75                | 25 1100   | 2030x2870 |                              |           | 4400                | 1450                   | 2030x2870       |           |           |      |           |
| P17-25120 | D2            |               |             |                      |                 | 2                   | 25 1100   | 2030x2870 | 4500                         | 1600      |                     |                        | 2030x2870       | 14        |           |      |           |
|           |               |               |             |                      |                 | 2.5                 | 25 1100   | 2030x2870 |                              |           | 4800                | 2000                   | 2030x2870       |           |           |      |           |
| P17-25180 | D2            |               |             |                      |                 | 3                   | 25 1100   | 2030x2870 | 5250                         | 2500      |                     |                        | 2030x2870       | 22        |           |      |           |
|           |               |               |             |                      |                 |                     |           |           |                              |           | 2030x2870           |                        |                 |           |           |      |           |
| P21-2560  | D2            |               |             |                      |                 | 21                  | 1428      | 1800x2300 | -                            | 25 1200   | 2230x2970           | 4200                   | 1300            | 2230x2970 |           |      |           |
| P21-2596  | D2            | 1.6           | 25 1200     | 2230x2970            | 4350            |                     |           |           |                              | 1400      | 2230x2970           |                        |                 | 16        | 100       |      |           |
|           |               | 1.75          | 25 1200     | 2230x2970            |                 |                     |           |           |                              |           | 4400                | 1450                   | 2230x2970       |           |           | 16   | 100       |
| P21-25105 | D2            | 2             | 25 1200     | 2230x2970            | 4500            |                     |           |           |                              | 1600      |                     |                        | 2230x2970       | 20        | 150       |      |           |
|           |               | 2.5           | 25 1200     | 2230x2970            |                 |                     |           |           |                              |           | 4600                | 2000                   | 2230x2970       |           |           | 24   | 150       |
| P21-25150 | D2            | 3             | 25 1200     | 2230x2970            | 5250            |                     |           |           |                              | 2500      |                     |                        | 2230x2970       | 28        | 150       |      |           |
| P21-25180 | D2            |               |             |                      |                 |                     |           |           |                              |           | 2230x2970           |                        |                 |           |           |      |           |
|           |               |               |             |                      |                 |                     |           |           |                              |           | 2230x2970           |                        |                 |           |           |      |           |

**NOTE:**

- The above table complies with IS14665:2000 standards
- Please contact to our local agency to check for other standards.
- Hoistway dimensions are the minimum dimension after the building work.
- Hoistway dimensions in chart are the minimum requirement.
- The hoistway structure wall must be 150mm thick (RCC) or more.
- Piping, wiring and cables not relevant to elevator are prohibited inside the hoistway.
- If the size of the hoistway is greater than above sizes, OH will be larger, please contact us.
- In case that more than one (simplex) elevator is required, please contact us
- In above table, OH is for door height of 2100mm and cage height of 2300mm.
- Hoistway width centre is not always cage width centre
- Example: P14W, W-Wide car ; D: Deeper car ; D2: front and rear opening door
- If CWT Safety required then the size of the hoistway is greater than above sizes, OH will be larger, please contact us.

## **SUB-HEAD: R. UPS SYSTEM**

### **1.0 General**

#### **1.1 Summary**

The units will have state-of-the-art technology with high degree of reliability in operation for continuous operation 24 hrs. and 365 days an year. This specification defines the electrical and mechanical characteristics and requirements for a continuous duty, highly reliable standalone type **true on-line double conversion UPS system using PWM IGBT technology** i.e. the **IGBT** Rectifier of the UPS system converts the input AC power to DC and then the **IGBT** inverter converts the DC into clean AC power. The UPS must use the most advanced Microprocessor technology. The UPS shall provide high quality AC power for sensitive electronic equipment loads. It should also supply clean power automatically without any break in the supply in the absence of raw power. Under no conditions will the protected system get direct supply from the raw mains unless there is fault in the protected system.

#### **System Configuration and operation in normal conditions:**

Each modular UPS unit shall be made up of the following components, described in detail in this specification:

- IGBT rectifier
- battery charger
- IGBT inverter
- Isolation Transformer
- battery
- automatic bypass (via a static switch)
- user and communications interface
- battery management system.

Following protections shall be provided with each UPS module:

- Inverter Under & Over voltage protection.
- Inverter over temperature protection.
- Over load current protection.
- Battery under/ over voltage protection.
- Battery end of discharge protection.
- Manual by-pass closed.
- By-pass SCR failure.
- Back feed fault.
- Output short circuit.
- Rectifier input under/ over voltage.
- EPO (Emergency power off)
- Rectifier input
- Over temperature.
- Input single phase/ phase reversal.
- Rectifier input under/ over frequency.
- DC short circuit

Software base control & monitoring on remote PC on LAN shall be provided.

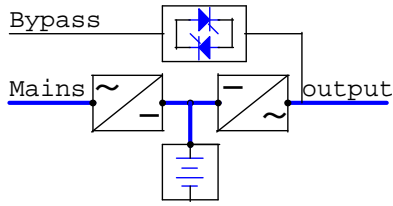
### **2.0 Modes of Operation**

The UPS system shall operate in double-conversion mode as indicated below.

#### **2.1. Normal operation**

*(normal AC source available)*

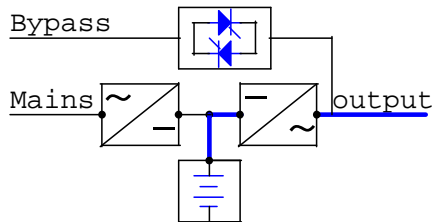
The rectifier of each modular UPS unit shall supply its inverter and charger. The UPS shall continuously supply the load with backed up electrical energy and the charger shall float charge the battery.



**Fig-2 (A)**

**2.2. Operation on battery power**  
*(normal AC source not available or outside tolerances)*

Upon failure or excessive deterioration of the normal AC source, the inverter of UPS unit shall continue to supply the load from battery power without interruption or disturbance, within the limits imposed by the battery backup time.



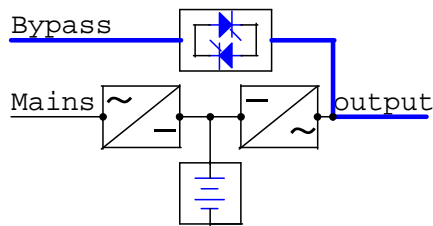
**Fig.-2(B)**

**2.3. Battery recharging**  
*(normal AC source restored)*

When the normal AC source is restored, the rectifier of each modular UPS unit shall again power its inverter, without interruption or disturbance to the load, while the charger automatically recharges the battery.

**2.4. Transfer to bypass AC source**  
*(system without redundancy)*

The system does not provide redundancy. The inverter of the UPS shall supply the load. The automatic bypass of UPS unit shall be connected to the same bypass AC source. Voluntary shutdown or a major fault on a modular UPS unit shall result in automatic transfer, without interruption, of the load to the bypass AC source via the bypass of each modular UPS unit, including the unit shut down, if the AC bypass is within tolerances and synchronised with the inverter outputs. On request, the UPS system may automatically transfer the load with a micro-interruption (adjustable from 15 to 1000 ms) if synchronisation with the bypass source has not been established, to enable operation in downgraded mode and enhance supply of power to the load. In all cases, to ensure load transfer in complete safety, the system shall simultaneously control the static switch. Modular UPS units shall continue to supply the load.



**Fig-2(C)**

## 2.5. UPS-system maintenance

All power and control electronics of the modular UPS units making up the UPS system shall be accessible from the front of the UPS.

For maintenance purposes, the UPS system shall include an external, mechanical, manual bypass system with one-button operation, common to all modular UPS units.

For personnel safety during servicing or testing, this system shall be designed to isolate the UPS system while continuing to supply power to the load from the bypass AC source. The UPS shall also include a device making it possible to isolate the rectifier and the charger of each modular UPS unit from the normal AC source.

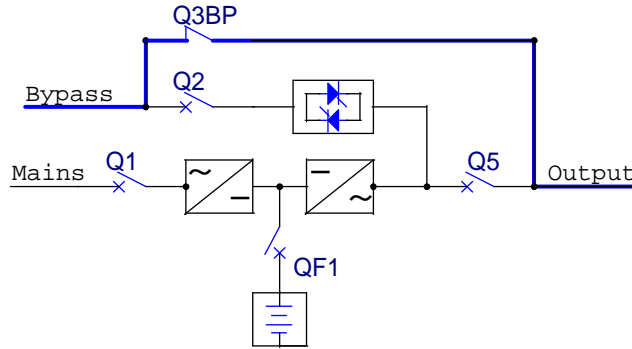


Fig. -2(D)

## 2.6. Battery maintenance

For safe maintenance, the battery of each modular UPS unit shall include a circuit breaker to isolate the battery from the rectifier, the charger and the inverter. When the battery is isolated from the system, the UPS shall continue to supply the load without interruption or disturbance, except in the event of a normal AC source outage.

## 2.7. Cold start (normal AC source absent)

The battery of each modular UPS unit shall be capable of starting the UPS if the normal AC source is absent and continue supplying power to the load within the specified backup time. Cold start on battery power shall be possible on the condition that the system shall have started at least once on normal AC power.

### Sizing and general characteristics

#### 3.1. Technology

The UPS system technology shall be based on IGBT transistors for all the power converters (rectifier, charger and inverter with variable chopping frequency).

#### 3.2. Rating

The UPS system shall be sized to continuously supply a load of ----- kVA at a power factor of 0.8.

The UPS system shall be made up of 1 UPS unit, having a power rating of ----- kVA.

There shall be ----- KVA units operating independently, with independent 90 minutes battery backups.

#### 3.3. Battery backup time

The battery backup time in the event of a normal AC source outage shall be 10 minutes, for a load power factor of 0.8 for each UPS.

The battery of each UPS unit shall be designed for a service life of 5 years. It shall be selected and sized correspondingly, for a load power factor of 0.8

### 3.4. Types of loads accepted

The UPS system shall accept high crest factors (3:1) without derating (kW) to ensure correct operation with computer loads and loads where the leading power factor can reach 0.9.

The total harmonic voltage distortion at UPS output (THDU downstream) shall respect the following limits:

- THDU downstream ph/ph  $\leq 3\%$  for non-linear loads.

### 3.5. PFC sinusoidal-current input rectifiers

The UPS system shall not draw a level of harmonic currents that could disturb the upstream AC system, i.e. it shall comply with the stipulations of guide IEC 61000-3-4.

The PFC input rectifiers of the modular UPS units, using sinusoidal-current IGBTs, shall have the following performance levels:

- total harmonic current distortion (THDI) upstream of the rectifier not exceeding 5%
- input power factor (PF) greater than 0.99 from 50% load upwards.

### 3.6. Outputs without a transformer

To reduce losses, dimensions and weight, the output of each UPS unit shall be of the transformer less type and the neutral shall be recreated electronically.

### 3.7. Efficiency

Overall efficiency (between the rectifier inputs and the UPS output) shall be greater than or equal to:

- 93% from 50% load to full rated load (In).

**Battery Management Function** - The UPS has advanced battery management functions including battery fault detection, backup time & remaining life forecast.

**Soft Start Function** - Complete delay soft start function can reduce the surge to the UPS unit and utility source.

**Alarm and Protection Function** - The UPS can generate audible and visual alarm through LCD, input/ output contacts and network transmission. It can help maintenance personnel to locate and clear the faults that are sent out in time, accurately and in detail.

**Automatic Re-start when Utility returns** – On failure of the input mains supply the UPS goes to battery mode. After the batteries are completely discharged the UPS system shuts down. It must automatically restart on the resumption of the input supply.

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 Design Requirements - UPS Module

#### A. Voltage.

Input/ Out voltage specifications of the UPS shall be:

Rectifier Input: (380) (400)(415) volts, three-phase 4-wire-plus-ground.

Bypass Input (if used): (380) (400)(415) volts, three-phase, 4-wire-plus-ground.

Output: 415 volts, 3 phase, 4-wire-plus-ground.

#### B. Output Load Capacity

Specified output load capacity of the UPS shall be ----- KVA at 0.8 lagging power factor.

### 1.2.2 PERFORMANCE REQUIREMENTS

#### 1. AC Input to UPS

A. Voltage Configuration: three-phase, 4-wire plus ground.

B. Voltage: (380)(400)(415) V

- C. Voltage Range: +/-15% of nominal.
- D. Frequency: Field selectable 50Hz or 60 Hz
- E. Frequency: Nominal frequency range +/- 10%
- F. Voltage distortion: The harmonic content introduced into the mains supply shall comply with IEC 61000-3-4/ AS2279 Part 2 for harmonic voltage distortion at the Point of Common Coupling (PCC) with other loads. Where higher impedance Mains or Generator supplies are present, the manufacturer shall offer reduced current distortion options to ensure IEC 61000-3-4/ AS2279 Part 2 requirements are complied to when interfaced with the proposed UPS system.
- G. Input PF: > 0.99 from 50% to 100% of rated load.
- H. Input power Factor at low operating loads of <25% shall not lead to leading power factor at any time.

## 2. AC Output, UPS Inverter

- a) Inverter Shall be IGBT based
- b) Voltage: (415)V
- c) Voltage Configuration: Three-phase, 4-wire plus ground.
- d) Voltage Regulation:  $\pm 1\%$  steady state.
- e) Frequency: Field selectable 50 Hz or 60Hz, (+ 0.5 or 2Hz adjustable).
- f) Frequency Slew Rate: 1Hz/ sec to 2Hz/ sec adjustable
- g) Phase Displacement:  $\pm 1$  degree for balanced load.  
  
 $\pm 1$  degree for 100% unbalanced load.
- h) Voltage Distortion: 1% Typical 2% maximum for liner loads  
  
<5% total harmonic distortion (THD) for 100% non-linear loads with 3:1 crest factor.
- i) Output Power Rating: Rated kVA at 0.8 lagging power factor.
- j) Overload Capability: 110% for 60 minutes  
125% for 10 minutes  
150% for 30 seconds  
200% for 500 milliseconds
- k) Voltage Transient Response:  $\pm 2\%$**
- l) Transient Recovery Time: to within  $\pm 1\%$  of output voltage within 60 milliseconds
- m) Voltage Unbalance: Balanced load 1%  
  
100% unbalanced load 2%
- n) Inverter Short Circuit Current Limit:  
150% full load current for 30 seconds  
270% full load current for 150 milliseconds

### 1.3 ENVIRONMENTAL CONDITION

- 1.3.1 The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

#### A. Operating Ambient temperature

- UPS Module: 0°C to 40°C
- Battery: 25  $\pm$  5°C

**B. Storage/ Transport Ambient Temperature**

-25°C to 70°C

**C. Relative Humidity:** <90% at 20°C

**D. Altitude Operating:** to 1000 meters above mean Sea Level de-rated for higher altitude applications. 1% per 100m between 1000 & 2000

**E. Audible Noise**

Noise generated by the UPS under any condition or normal operation shall not exceed 65 dbA measured 1.5 meter from surface of the UPS.

**1.3.2 Design Requirements - Matching Battery**

**A. Battery Cells:** Sealed, lead-acid, valve-regulated.

**B. Reserve Time:** minutes at full load, 0.8 power factor, with ambient temperature between 20 and 30°C.

**1.4 UPS Delivery Submittals**

Submittal upon UPS delivery shall include:

**One instruction manual:** Manual shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

**1.5 Quality Assurance**

**1.5.1 Manufacturer Qualifications**

A minimum of five year's experience in the design, manufacture, and testing of solid-state UPS systems is required. Standards ISO90001, CE certified to level A of EN55022.

**1.5.2 Factory Testing**

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

**2.0 PRODUCT**

**2.1 Fabrication**

**2.1.1 Materials**

All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

**2.1.2 Construction and Mounting**

The UPS unit, comprised of input isolator, rectifier/ charger, inverter, static transfer switch, maintenance bypass switch, and static bypass input switch should be housed in a freestanding steel enclosure with key-lockable doors. Front access only shall be required for expedient servicing, adjustments, and installation. The enclosure will be built to comply with IP20 when the doors are open. The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. The UPS shall be constructed of replaceable subassemblies. Printed circuit assemblies shall be plug-in. Like assemblies and like components shall be interchangeable.

**2.1.3 Cooling**

Cooling of the UPS shall be forced-air. Low velocity fans shall be used to minimize audible noise output. Fan power shall be provided by the UPS output. Temperature will be monitored by thermal sensors.

## 2.2 Components

### 2.2.1 Rectifier/Charger

#### A. General

The term rectifier/ charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for input to the inverter and for battery charging. The rectifier/ charger shall be 6 Pulse three phase-controlled IGBT based bridge type with constant voltage/ current limiting control circuitry.

#### B. Input Current Walk-In

The rectifier/ charger shall contain a timed walk-in circuit that causes the unit to gradually assume the load over a 10-second time interval after input voltage is applied.

#### C. Fuse Failure Protection

Power semiconductors in the rectifier/ charger shall be fused with fast-acting fuses, so that loss of any one-power semiconductor shall not cause cascading failures.

#### D. DC Filter

The rectifier/ charger shall have an output filter to minimize ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 1% RMS. The filter shall be adequate to insure that the DC output of the rectifier/ charger will meet the input requirements of the inverter. The inverter shall be able to operate from the rectifier/ charger with the battery disconnected.

#### E. Battery Recharge

In addition to supplying power for the inverter load, the rectifier/ charger shall be capable of producing battery-charging current to recharge the battery. After the battery is recharged the rectifier/ charger shall maintain the battery at full charge until the next emergency operation. The charging shall be an automatic cycle per DIN 41772 characteristic I -U (boost to floating charge switching, with current measuring criteria and control during recharge). Both float and recharge voltages shall be adjustable. The charge voltage can also be manually controlled. The use of the inverter is inhibited during manual charging.

### 2.2.2 Inverter

#### A. General

The term inverter shall denote the solid-state equipment and controls to convert DC power from the rectifier/ charger or battery to regulated AC power for supporting the critical load. The inverter shall be an **Insulated Gate Bipolar Transistor, phase-controlled, pulse width modulated (PWM)** design capable of proving the specified AC output.

#### B. Overload Capability

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

#### C. Fault Clearing and Current Limit

Without bypass supply available to the inverter shall be capable of supplying an overload current of **150% of its full-load rating in excess of Thirty Seconds**. For greater currents or longer time duration, the inverter shall have electronic greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload (Vce Trip). Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement **to clear protective fuses**.

#### D. Output Frequency

The output frequency of the inverter shall be controlled by an oscillator. The oscillator shall hold the inverter output frequency to + .01% for steady state and transient conditions.



### 2.2.3 Display and Controls

#### A. Monitoring and Control

The UPS shall be provided with a microprocessor based unit status display and controls section designed for convenient and reliable user operation. A system controls section designed for convenient and reliable user operation. A system power flow diagram, a percentage load and battery time remaining display shall be provided as part of the monitoring and controls sections, which depicts a single-line diagram of the UPS. Illuminated visual indicators shall be of the long-life light-emitting diode (LED) type. All of the operator controls and monitors shall be located on the front of the UPS cabinet. The monitoring functions such as metering, and alarms shall be displayed on an alphanumeric LCD display. Additional features of the monitoring system shall include:

Menu-driven display with test format selectable in five (5) languages (English, German, French, Spanish, or Italian).

#### B. Metering

The following parameters shall be displayed:

Battery voltage

Battery charge/ discharge current

Battery remaining backup time

Input voltage, frequency and current

Output AC voltage line-to-line and line to neutral Output AC current for each phase and neutral and % load used of nominal capacity for each phase.

Output frequency

Output Crest Factor

Output Power Factor

Active Power (kW) Apparent Power (kVA)

Temperature - Ambient, battery

#### C. Warning and Alarm Messages

Normal Operation Input breaker open

Output breaker open Rect. breaker open

Battery breaker open On Manual bypass

Bypass absent Bypass over limits

Bypass under limits Bypass freq. over limit

Bypass Phase Rotation Bypass SCR fail

Bypass inhibit Local Bypass inhibit remote

Load on bypass on bypass due to over temperature

Rectifier off Local Rect. off remotely

Rectifier Block Rectifier overload

Rectifier over temp Rectifier Fuse fail

Inverter off local. Inverter off remotely

Inverter block Inverter overload

Inverter over temp Inverter out of sync

Inverter overvoltage Inverter under voltage

Inverter fuse fail D.C Volts High

D.C Volts low Inverter no voltage

Inverter Peak Volts low Battery under test

Battery test fail Discharge battery

Battery E.O.D. Boost Charge

DC Bus over volt Battery Low

Battery Fuse Fail Bat. Fast over volt

Bypass overuse Cut-off overload

Cut-off over temp Cut-off emergency stop

Overload Cut-off max overload

#### Software Warnings

Bad EPROM program Err. LRC param. Pag 1

Err. LRC Param Pag 2 Err. LRC Param Pag 3

Err. LRC Alar Hist Err. LRC Even Hist

Back-up battery low Error LRC table

Error LRC Panel Modem Wrong Config  
Modem no response Modem false command  
Modem time-out trasm Can bus no response  
Autonomy XXXX min

**D. Controls**

Four pushbuttons shall be located on the operator control panel.

Enter  
Escape  
Up  
Down

The push buttons shall permit the operator either to select options from a menu for display on the LCD winder or to change the value of some parameters. One push-button - alarm silence switch.

**E. Power Status Diagram**

A mimic panel shall be provided to depict a single line diagram of the UPS.

Indicating lights shall be integrated within the single line diagram to illustrate the status of the UPS. The three LEDs shall indicate the following status.

Bypass voltage OK  
Load on bypass  
Load on inverter

The % load with respect to the nominal power and the real time remaining battery backup time should be displayed in the LCD display of the UPS.

**F. Ethernet Connectivity Interface Port**

An Ethernet Connectivity based interface port shall be provided for remote display of UPS status information on a computer terminal (by others).

**2.2.4 Static Transfer Switch**

**A. General**

A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously to enable the critical load to be connected to the inverter output or bypass power source. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals, and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS, or for bypassing the UPS for maintenance.

**B. Uninterrupted Transfer**

The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:

Inverter overload capacity exceeded  
Critical AC load over voltage or under-voltage  
UPS fault condition.

The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:

Inverter/ bypass voltage difference exceeding pre-set limits  
Bypass frequency out of limits  
Bypass out-of-synchronization range with inverter output.

**C. Uninterrupted Retransfer**

Retransfer of the critical AC load from the bypass source to the invert output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

Bypass out of synchronization range with inverter output  
Inverter/ bypass voltage difference exceeding pre-set limits  
Overload condition exists in excess of inverter full load rating  
UPS fault condition present.

## 2.2.5 Maintenance Bypass Isolator

### A. General

A manually operated maintenance bypass isolator shall be incorporated into the UPS cabinet to directly connect the critical load to the input AC power source, bypassing the rectifier/charger, inverter, and static transfer switch.

### B. Maintenance Capability

With the critical load powered from the maintenance bypass circuit, it shall be possible to check out the operation of the rectifier/charger, invert, battery, and static transfer switch.

### C. Wall Mounted Battery Circuit Breaker (BCB)

A battery circuit breaker shall be provided to isolate the battery from the UPS. This breaker together with battery circuit breaker controller board shall be in a separate wall mounted enclosure. The battery breaker provides a manual disconnecting means, short circuit protection, and over-current protection for the battery system. When opened, there shall be no battery voltage in the UPS enclosure.

### D. Split Bypass feature

UPS shall have both a rectifier input and bypass input. Two separate input sources must be provided. An internal bypass circuit breaker shall be provided for connection to the bypass source.

### E. BMS connectivity

Each UPS should have Network Interface Card for Modbus BMS & LAN Connectivity simultaneously. RS 485 Port has to be available for BMS interface in the UPS module. RJ 45 connectivity over Ethernet has to be available for LAN Connectivity.

## 3.0 FIELD ENGINEERING SUPPORT

The UPS manufacturer shall directly employ a national field service network staffed by factory trained field service engineers to provide start up, maintenance and repair of the UPS equipment.

### Standards and tests

## 3.1. Standards

All equipment shall be designed and built in accordance with accepted engineering practice and applicable international standards, in particular the standards listed below.

### A. Safety:

- IEC 60950-1/ EN 60950-1  
Information technology equipment - Safety - Part: General requirements
- IEC 62040-1/ EN 62040-1  
Uninterruptible power systems (UPS) - General and safety requirements for UPS.
- IEC 62040-3 / EN 1000-3  
Uninterruptible power systems (UPS) - Method of specifying the test and performance requirements.
- IEC 60439  
Low-voltage switchgear and controlgear assemblies.
- LV directive: 2006/95/EC

### B. Harmonics:

- IEC 61000-2-2 / EN 61000-2-2  
Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems.
- IEC 61000-3-2 / EN 61000-3-2  
Limits for harmonic current emissions (equipment input current  $\leq 16$  A/ph).
- IEC 61000-3-4 / EN 61000-3-4  
Limits for harmonic current emissions (equipment input current  $> 16$  A/ph).
- IEC 61000-3-5 / EN 61000-3-5  
Limitation of voltage fluctuations and flicker.
- EN 50160  
Voltage characteristics of public networks.

- IEEE 519  
Recommended practices and requirements for harmonic control in electrical power systems.

**C. EMC:**

- EN 50091-2  
UPS - EMC.
- IEC 62040-2/ EN 62040-2  
Uninterruptible power systems (UPS) - Electromagnetic compatibility (EMC) requirements.
- EMC Directive 2004/108/EC  
For equipment liable to cause or be affected by electromagnetic disturbances.

**D. Quality:**

Design, production and servicing in compliance with standard ISO 9001 - quality organisation.

**E. Ecological environment:**

Manufacturing in compliance with standard ISO 14001.

**F. Acoustic noise**

- ISO 3746: Sound power levels.
- ISO 7779/ EN 27779: Measurement of airborne noise emitted by computer and business equipment.

What is more, the equipment shall comply with eco-design and eco-manufacturing criteria in view of sustainable development and to that end, the manufacturer shall be able to demonstrate:

- R&D and production on an ISO 14001 certified site
- Manufacture with over 90% recyclable materials
- Capacity to recover products at the end of their service life and provide proof of destruction by a certified organisation.
- The environmental profile of the product, which shall be supplied with the sales offer.

**3.2. Certification of conformity**

The manufacturer shall provide, on request, a complete qualification file demonstrating compliance with the above standards. What is more, the indicated levels of performance shall be confirmed by certification from independent laboratories (e.g. TÜV or Veritas).

### TECHNICAL SPECIFICATIONS OF UPS SYSTEM

|          |   |   |
|----------|---|---|
|          | UPS TOPOLOGY  | True on-line double conversion PWM IGBT based.                    |
| <b>A</b> | <b>INPUT</b>  |   |
| 1        | Input voltage   | 415V, 3 phase, 4 wires  |
| 2        | Input voltage tolerance   | +10 %, -15%   |
| 3        | Input frequency   | 50 Hz   |
| 4        | Input frequency tolerance   | +/- 15 %  |
| 5        | Input current limit   | 115% (Adjustable between 100 - 125%)                              |
| 6        | Power walk - in period  | 30 seconds  |
|          | Input THDi  | <5% for 25% to 100% load  |
|          | Input Pf (from 50% load)  | >0.99   |
| 7        | Input circuit Preferred   | IGBT based, PFC bridge rectifier                                  |
| 8        | Inbuilt Input & Bypass Isolator   | Required, Isolator  |
| <b>B</b> | <b>OUTPUT</b>   |   |
| 1        | Module full load rating kVA/ kW   | ----- KVA   |
| 2        | Rated voltage   | 3 phase   |
| 3        | Rated current   | Vendor to specify   |
| 4        | Phase Voltage asymmetry (For Three Phase output UPS only)<br>a) Balance load<br>b) 100% unbalanced load   | 1%<br>2%  |
| 5        | Voltage Phase shift (In case of three phase Output UPS)<br>- With balanced load<br>- With Unbalanced load   | 120 +/- 1 deg<br>120 +/- 1 deg                                    |
| 6        | Output voltage adjustment range   | +/- 5%  |
| 7        | Phase displacement (In case of three phase Output UPS)<br><br>a) Balance load<br>b) 100% unbalanced load  | 120 deg. +/- 1 deg<br>120 deg. +/- 1 deg                          |
| 8        | Output power factor range   | 0.8 or better   |
| 9        | Internal oscillator stability   | +/- 0.1 %   |
| 10       | Mains synchronization tracking  | +/- 1 Hz (settable to +/-2)                                       |
| 11       | Max. Rate of change of frequency  | 1 Hz. Per second  |
| 12       | Output voltage harmonics<br>a) Linear load<br>b) Non-linear load (Crest factor of 3:1)  | < 2%<br>< 5 %   |
| 13       | Crest Factor  | 3: 1  |
| 14       | Overload rating   | 110% for 60 minutes<br>125% for 10 minutes<br>150% for 30 seconds |
| 15       | Overload trip   | 10 min at 125% reducing to 30 seconds at 150%                     |
| 16       | Inverter Efficiency   | > 94%   |
| 17       | Current limit short   | Set at 150% of the output power                                   |
| 18       | Transient Response<br>a) 100% load change<br>b) Manual transfer of load from UPS to bypass and vice-versa<br>C) Automatic transfer of load form UPS to bypass | +/- 2%<br>0 msecs when in sync<br>0 msecs in sync                 |
| 19       | Transient recovery time   | Recovery to +/- 1 % in < 60 msec.                                 |
| 20       | Manual Bypass Isolator  | One with each UPS Module  |
| 21       | Confirmed Overall Efficiency of UPS with all  |   |

|  |                   |      |
|--|-------------------|------|
|  | Filter Options at |      |
|  | 100% Load         | >94% |
|  | 75% Load          | >94% |
|  | 50% Load          | >93% |
|  | 25% Load          | >92% |

|          |  |  |
|----------|--|--|
| <b>C</b> | <b>DC CHARACTERISTICS</b>                |  |
| 1        | Nominal DC bus voltage                   | 408 V to 576 V   |
| 2        | Battery isolation                        | Manually closed circuit breaker with under voltage release and over current trip |
| 3        | Battery fully discharge voltage          | 326V   |
| 4        | Allowable voltage drop in battery cables | 3 volts at end of discharge voltage.   |
| 5        | Battery float voltage                    | 459 V  |
| 6        | Battery end voltage                      | 340 V  |
| 7        | DC Bus voltage ripple                    | < 1 RMS  |
| 8        | Battery recharge current limit           | Amps, Vendor to specify  |
| 9        | No. Of cells                             | Vendor to specify  |

|          |   |
|----------|---|
| <b>D</b> | <b>CONTROLS</b>   |
| 1        | Charger input Isolator  |
| 2        | Battery circuit breaker (mounted separately in its own enclosure) |
| 3        | Inverter output Isolator  |
| 4        | Bypass line Isolator  |
| 5        | Maintenance Bypass Isolator                                       |
| 6        | Alarm acknowledge / Reset button                                  |
| 7        | Inverter On-Off Pushbutton for Manually switching of the Inverter |
| 8        | Emergency off push button   |

|          |   |
|----------|---|
| <b>E</b> | <b>MEASURING INSTRUMENTS</b>  |
| 1        | LCD panel for Measuring Input Voltage, output currents and Frequency, Output voltages, Output currents and Frequency, Battery Voltage and Charging/ Discharging current.  |
| 2        | LCD panel should display status of the Battery capacity and backup Time in minutes.   |
| 3        | Log of time-stamped events<br>This function shall store in memory and make available, for automatic or manually initiated recall, time-stamped logs of all important status changes, faults and malfunctions, complete with an analysis and display of troubleshooting procedures. It shall be possible to time stamp and store at least 2500 events. |

|          |  |
|----------|--|
| <b>E</b> | <b>PROTECTIONS</b>                             |
| 1        | RC surge suppressor.                           |
| 2        | Sustained under voltage on input side          |
| 3        | Phase loss on input side.                      |
| 4        | Negative sequence on input side                |
| 5        | Semiconductor fuses in the lines for thyristor |
| 6        | Snubber circuit for device dv/ dt protection   |
| 7        | Charger input current limit                    |
| 8        | HRC fuses for filter capacitors                |
| 9        | Battery current limit                          |
| 10       | DC over voltage                                |
| 11       | Low battery                                    |
| 12       | Semiconductor fuses at inverter output         |
| 13       | Overload                                       |
| 14       | Over temperature for the inverter              |
| 15       | HRC fuses in the control circuit               |

|          |                                 |
|----------|---------------------------------|
| <b>F</b> | <b>INDICATIONS (ALARMS)</b>     |
| 1        | Inverter Failure                |
| 2        | Overload (if load exceeds 100%) |
| 3        | Overload shutdown               |

|    |                              |
|----|------------------------------|
| 4  | Emergency shutdown           |
| 5  | Equipment over temperature   |
| 6  | Maintenance Bypass ON        |
| 7  | DC over voltage              |
| 8  | Low battery                  |
| 9  | Battery circuit breaker open |
| 10 | Battery on load              |
| 11 | Mains failure                |
| 12 | Rectifier Failed or Off      |
| 13 | Inverter Unsynchronized      |
| 14 | Load on bypass               |
| 15 | Output voltage error         |

|  |   |
|--|---|
| <b>G. DC link characteristic with battery back-up (as per BOQ)</b> |   |
| NO. of 2/12V SMF lead acid batteries                               | Vendor to Specify                               |
| AH rating for each UPS   | Vendor to Specify rating and no. along with VAH |
| Model / Make   | G & Y/ Panasonic                                |
| Float voltage  | 459 V   |
| Final discharge voltage  | 340 V   |
| Voltage tolerance  | +/- 1 %   |
| DC ripple  | < 1 %   |
| Charging current limit   | 10 %  |
| Battery Isolation  | With U/V release type Battery Circuit Breaker   |

**Mechanical Dimensions:**

|   |                                      |
|---|--------------------------------------|
| Weight of UPS – Kg  | Vendor to specify                    |
| Dimension of UPS (L x D x H) in mm                                      | Vendor to specify                    |
| Ventilation   | Forced air cooled with internal fans |
| Protection Level:<br>* With enclosure closed<br>* With front doors open | IP 20<br>IP 20                       |

**Environmental:**

|                       |                          |
|-----------------------|--------------------------|
| Operating temperature | 0 – 40 deg. C.           |
| Relative humidity     | < 90 % (20 deg. C.)      |
| Altitude              | 1000 m                   |
| Storage temp.         | From -25 to + 70 deg. C. |

The following shall be filled in all respects by the tenderer for technical evaluation.

| S.No     | Description   | To be filled by Tenderer |
|----------|---|--------------------------|
| 1        | Name of the Organization                            |                          |
| 2        | Total years of Experience                           |                          |
| 3        | Total list of customers                             |                          |
| 4        | Highest capacity of UPS installed                   |                          |
| 5        | Capacity of UPS offered for CLIENT                  |                          |
| 6        | Model no.   |                          |
| <b>1</b> | <b>INPUT</b>  |                          |
| i        | Input voltage                                       |                          |
| ii       | Input voltage tolerance                             |                          |
| iii      | Input frequency                                     |                          |
| iv       | Input frequency tolerance                           |                          |
| v        | Input Power factor at nominal voltage and full load |                          |
| vi       | Harmonic Filters                                    |                          |
| vii      | Input current limit                                 |                          |
| viii     | Power walk - in period                              |                          |
| ix       | Input circuit                                       |                          |
| <b>2</b> | <b>OUTPUT</b>                                       |                          |
| i        | Module full load rating KVA/ KW                     |                          |
| ii       | Rated voltage                                       |                          |
| iii      | Rated current                                       |                          |
| iv       | Output voltage adjustment range                     |                          |
| v        | Output power factor range                           |                          |
| vi       | Internal oscillator stability                       |                          |
| vii      | Mains synchronization tracking                      |                          |
| viii     | Max. rate of change of frequency                    |                          |
| ix       | Output voltage harmonics                            |                          |
| x        | a) Linear load                                      |                          |
| xi       | b) Non-linear load (Crest factor of 3:1)            |                          |
| xii      | Crest Factor  |                          |
| xiii     | Overload rating                                     |                          |
| xiv      | Overload trip                                       |                          |
| xv       | Inverter Efficiency                                 |                          |
| xvi      | Current limit short                                 |                          |
| xvii     | Transient Response                                  |                          |
| xviii    | a) 100% load change                                 |                          |
| xix      | b) Manual transfer of load from UPS to              |                          |
| xx       | by-pass and vice-versa                              |                          |
| xxi      | C) Automatic transfer of load form UPS              |                          |
| xxii     | to bypass   |                          |
| xxiii    | Transient recovery time                             |                          |
|          |   |                          |
| <b>3</b> | <b>DC CHARACTERISTICS</b>                           |                          |
| i        | Nominal DC bus voltage                              |                          |
| ii       | Battery isolation                                   |                          |
| iii      | Battery fully discharge voltage                     |                          |
| iv       | Allowable voltage drop in battery cables            |                          |
| v        | Battery float voltage                               |                          |
| vi       | Battery end voltage                                 |                          |



| <b>S.No</b> | <b>Description</b>  | <b>To be filled by Tenderer</b> |
|-------------|---|---------------------------------|
| vii         | DC Bus voltage ripple   |                                 |
| viii        | Battery recharge current limit  |                                 |
| ix          | No. of cells  |                                 |
| x           | Battery sharing cubicle   |                                 |
| <b>4</b>    | <b>H. DC link characteristic for .... min battery run time on full load</b> |                                 |
| i           | No. of 12V SMF lead acid batteries (or)                                     |                                 |
| ii          | AH rating   |                                 |
| iii         | Model/ Make   |                                 |
| iv          | Float voltage   |                                 |
| v           | Final discharge voltage   |                                 |
| vi          | Voltage tolerance   |                                 |
| vii         | DC ripple   |                                 |
| viii        | Charging current limit  |                                 |
| ix          | AH/ Nos.  |                                 |
| x           | Battery Isolation   |                                 |
| xi          | Battery sharing Cubicle   |                                 |
| xii         | Weight of UPS – Kg  |                                 |
| xiii        | Dimension of UPS (W x D x H ) in mm   |                                 |
| xiv         | Ventilation   |                                 |
| xv          | Colour (two tone)   |                                 |
| xvi         | Protection Level  |                                 |
| xvii        | Operating temperature   |                                 |
| xviii       | Max. Temp. for 8 hr. day  |                                 |
| xix         | Relative humidity   |                                 |
| xx          | Altitude  |                                 |
| xxi         | Storage temp.   |                                 |
| xxii        | Warranty offered on UPS   |                                 |
| xxiii       | Warranty offered on Battery bank  |                                 |
| xxiv        | Delivery Period   |                                 |

# **ALL INDIA INSTITUTE OF MEDICAL SCIENCES**

---

Guntur

Specification for Audio Visual Systems

# CONTENTS

|                                 |    |
|---------------------------------|----|
| A. Audio System: .....          | 3  |
| B. Video System: .....          | 25 |
| C. Control System: .....        | 51 |
| D. Video Conference .....       | 54 |
| E. Installation Equipment ..... | 55 |

## A. Audio System:

**A-1 Specification for 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories**

|   |
|---|
| <b>Approved Makes – Bose, Tannoy, JBL</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Recessed Ceiling Speaker and shall have the following minimum specification  |  |  |
| <p>Driver - 2.25" - 4"</p> <p>Frequency Response (+/-3 dB)- 95 Hz - 17 kHz</p> <p>Frequency Range (-10 dB)- 80Hz - 19kHz</p> <p>Nominal Sensitivity - 90°-140° Conical</p> <p>Power Handling- 16-50 Watts</p> <p>Nominal Impedance- 6/8 Ohms</p> <p>Sensitivity (SPL/1W@1m) - 92 SPL dB/1W/1m</p> <p>Rated SPL @ 1 m- 96 to 113 dB SPL</p> <p>Directivity Factor (Q)- &gt; 5.9 (averaged 1kHz – 6kHz)</p> <p>Directivity Index (DI)- &gt; 7.1 (averaged 1kHz – 6kHz)</p> |  |  |
| <b>Construction</b>  |  |  |
| <p>Enclosure- ABS</p> <p>Grille - Aluminium, Painted / Highly zinc-plated, finished in durable TGIC polyester powder coating</p> <p>Weight-&lt; 4.5 Kgs</p> <p>Unit should have relevant mounting and connector accessories required to be operational</p>   |  |  |

**A-2 Specification for Condenser Cardioid Boundary Microphone capsule with necessary mounting Accessories along with LED Ring with indicators & Push button for microphones**

|  |  |  |
|--|--|--|
| <b>Approved Makes – Beyerdynamic, Shure, Audia Technica</b>  |  |  |
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Boundary Microphone a have the following minimum specification   |  |  |
| Transducer Type- condenser (electret)<br>Polar Pattern- Cardioid /Half Cardioid<br>Frequency Response (near field)- 50 - 13000 Hz<br>Nominal Impedance- <200 Ohms<br>Signal to noise ratio / noise voltage- 69 dB<br>Maxi. SPL- <107 dB<br>Connector - XLR |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-3 Specification for Audio DSP with minimum 12 Mic/Line In, 8 Out should be able interconnected via AVB / Dante, with VOIP interface, necessary expanders/required no. of additional DSP's and accessories with sufficient Logic I/O ports/Box compatible with the DSP**

|   |  |  |
|---|--|--|
| <b>Approved Makes – Biamp, Bose, BSS</b>  |  |  |
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Audio DSP with minimum 12 MIC/Line Inputs & 8 Output and shall have the following minimum specification |  |  |

|  |  |  |
|--|--|--|
| <p>Number of Balanced Mic / Line Inputs - Minimum 12 balanced mic/line inputs</p> <p>Number of Balanced Line Outputs - Minimum 8 balanced mic/line outputs</p> <p>VOIP Connection- Minimum of 1</p> <p>Dynamic Range (20Hz~20kHz, 0dB gain, AEC on/off) - &gt; 108dB</p> <p>Frequency Response - 20Hz~20kHz ±0.4dB</p> <p>Crosstalk (below rated power) 20 Hz to 1kHz- &lt; -105 dB</p> <p>Maximum Output (balanced)- +24dBu</p> <p>Total Harmonic Distortion (THD) (@ Full rated power, 20Hz-20kHz)- &lt; 0.006%</p> <p>Voltage Gain at 1kHz - 0dB ~ +64dB</p> <p>Maximum Input Level- +24dBu</p> <p>Sampling Rate- 48kHz</p> <p>A/D - D/A Converters- 24-bit</p> <p>Power Consumption (100~240VAC 50/60Hz)- &lt; 50 Watts</p> <p>Signal Processing (MHz)- 400-600MHz</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-4 Specification for Audio DSP with minimum 10 Mic/Line In, 6 Line Out, necessary expanders/required no. of additional DSP's and accessories with sufficient Logic I/O ports/Box compatible with the DSP**

**Approved Makes – Biamp, Bose, BSS**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b></p> <p>The unit shall be Audio DSP with minimum 10 MIC/Line Inputs &amp; 6 Output and shall have the following minimum specification</p> |  |  |

|   |  |  |
|---|--|--|
| <p>Number of Balanced Mic / Line Inputs - Minimum 10 balanced mic/line inputs</p> <p>Number of Balanced Line Outputs - Minimum 6 balanced mic/line outputs</p> <p>Dynamic Range (20Hz~20kHz, 0dB gain, AEC on/off) - &gt; 105dB</p> <p>Frequency Response - 20Hz~20kHz ±0.4dB</p> <p>Crosstalk (below rated power) 20 Hz to 1kHz- &lt; -105 dB</p> <p>Maximum Output (balanced)- +24dBu</p> <p>Total Harmonic Distortion (THD) (@ Full rated power, 20Hz-20kHz)- &lt; 0.006%</p> <p>Voltage Gain at 1kHz - 0dB ~ +64dB</p> <p>Maximum Input Level- +24dBu</p> <p>Sampling Rate- 48kHz</p> <p>A/D - D/A Converters- 24-bit</p> <p>Power Consumption (100~240VAC 50/60Hz)- &lt; 50 Watts</p> <p>Signal Processing (MHz)- 400-600MHz</p> |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-5 Specification for Box Type Speaker with drivers: 2 X 6.5" LF, 1 X HF, minimum 175W @ 8 Ohm with necessary mounting Accessories - Under balcony Speakers**

**Approved Makes – Bose, Music-Group/Turbo sound, JBL**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <p><b>Performance</b><br/>The unit shall be Box Type Speaker and shall have the following minimum specification.</p>    |  |  |
| <p><b>Display:</b><br/>Frequency Response (+/-3 dB)- 90 Hz - 16 kHz</p> <p>Frequency Range (-10 dB)- 80 Hz - 18 kHz</p> |  |  |

|  |  |  |
|--|--|--|
| Sensitivity (SPL / 1 W @ 1 m) - $\geq 90$ dB   |  |  |
| Maximum SPL @ 1 m- $\sim 112.5$ dB   |  |  |
| Nominal Coverage Pattern (H x V)- Minimum $90^\circ \times 50^\circ$ better with rotatable high-frequency horn |  |  |
| Long-Term Power Handling- $\sim 175$ W   |  |  |
| Nominal Impedance- $8 \Omega$  |  |  |
| <b>Construction</b>  |  |  |
| Grille – 18-gauge (1.2 mm) perforated steel, powder-coated finish, black or white                              |  |  |
| Unit should have relevant mounting and connector accessories required to be operational                        |  |  |

**A-6 Specification for Bi amplified/Tri amplified 2/3 Way Dual 10" or better Line array module, with Individual Module Frequency Range of 60Hz - 16 kHz or better & Continuous Power Handling of  $\geq$  minimum 450W LF + 125W MF-HF. The Loudspeaker shall have a Max. SPL (Peak) of  $\geq 126$  dB or better for LF/MF-HF. It should have suitable Drivers for LF and MF/HF with Horizontal near dispersion pattern of  $90^\circ$  or better, vertical dispersion of the array shall be 70 degrees or better (3 array modules or better); Suitable OEM hardware for suspending the array with a safety factor of 8:1 or better.**

|   |                            |                |
|---|----------------------------|----------------|
| <b>Approved Makes – Bose, Music-Group/Turbo sound, JBL</b>  |                            |                |
| <b>Standard Compliance</b>  | <b>Compliance (Yes/No)</b> | <b>Remarks</b> |
| <b>Performance</b><br>The Unit shall be a Wall mounted plate with XLR audio input and network (Dante) audio output, shall have the following minimum specification. |                            |                |
| <b>Performance</b>  |                            |                |
| Frequency Response(+/-3dB)- 60 Hz -16 kHz   |                            |                |
| Frequency Response(+/-10dB)- 60 Hz -16 kHz  |                            |                |
| Nominal Coverage Pattern- $55^\circ, 60^\circ, 70^\circ, 90^\circ, 120^\circ$ Horizontal x $20^\circ - 40^\circ$ Vertical   |                            |                |
| Power Handling – HF –Minimum 450 W<br>MF –Minimum 125 W   |                            |                |
| Nominal impedance- $4/8 \text{ Ohm}$  |                            |                |
| <b>Construction</b>   |                            |                |
| Enclosure Material - Baltic birch plywood, engineered plastics, and steel frame   |                            |                |
| Grille- 19-gauge (1 mm) perforated steel, powder-coated finish, black   |                            |                |
| Unit should have relevant mounting and connector accessories required to be operational   |                            |                |

**A-7 & A-8 Specification for Dual 15-inch high-excursion or better woofers with frequency response (-10 dB) : 40 Hz - 280 Hz, The Sensitivity (SPL / 1 W @ 1 m) @ Array Position (free field)  $\geq 97$  dB SPL, Omni-directional below 100 Hz, The Maximum SPL @ 1 m Array Position (free field)  $\geq 127$  dB SPL, Long-Term Power Handling is minimum 1000 Watts @ 8 Ohms with Necessary mounting brackets**



| Approved Makes – Bose, Music-Group/Turbo sound, JBL  |                     |         |
|--|---------------------|---------|
| Standard Compliance  | Compliance (Yes/No) | Remarks |
| <b>Performance</b><br>The unit shall have the following minimum specification.   |                     |         |
| Frequency Range (-10 dB)- 40 Hz - 280 Hz<br><br>Nominal Coverage Pattern (H x V)- Omni-directional<br><br>Power Handling- Minimum 1000 W<br><br>Sensitivity SPL 1 W @ 1 m - < 97 dB SPL<br><br>Maximum SPL @ 1 m - < 127 dB SPL<br><br>Nominal Impedance- 2 x 8 Ohms |                     |         |
| <b>Construction</b>  |                     |         |
| Enclosure-13-ply Baltic birch plywood<br><br>Grille-18-gauge (1.2 mm) perforated steel, powder-coated finish, black<br><br>Weight->83 Kgs<br><br>Unit should have relevant mounting and connector accessories required to be operational                             |                     |         |

**A-9 Specification for Box Type Speaker drivers suitable for Stage Monitor : 2 X 8" LF, 1 X 1" HF with frequency response of 80Hz to 16kHz, Nominal coverage pattern of minimum 90 degree X 60 degree with rotatable high frequency horn, Power handling of minimum 300W @ 8 Ohm, Sensitivity of 93 dB SPL, with appropriate delay and necessary mounting bracket**

|  |
|--|
| <b>Approved Makes – Bose, Music-Group/Turbo sound, JBL</b> |
|--|

| Standard Compliance  | Compliance (Yes/No) | Remarks |
|--|---------------------|---------|
| <b>Performance</b><br>The unit shall be Box Type Speaker have the following minimum specification  |                     |         |
| Frequency Response (+/-3 dB)- 80 Hz - 16 kHz<br><br>Frequency Range (+/-10 dB)- 70 Hz - 16 kHz<br><br>Sensitivity (SPL / 1 W @ 1 m) - ≥ 93 dB<br><br>Nominal Coverage Pattern (H x V)- Minimum 90° x 60° |                     |         |

|   |  |  |
|---|--|--|
| Power Handling- Minimum 300W<br>Nominal Impedance- 4/8 Ω<br>Driver Compliment: Dual 8 or better   |  |  |
| <b>Construction</b>   |  |  |
| Enclosure- ABS<br><br>Grille -Perforated steel, powder-coated finish, black or white<br><br>Weight- < 23 Kgs<br><br>Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-10 Specification for Box Type Speaker drivers: minimum 1X 5.25 " LF, 1 X 2"HF suitable or better for Stage Fill speakers with frequency response of 100Hz to 16kHz, Nominal coverage pattern of minimum 60 degree X 60 degrees, Power handling of minimum 100W @ 8 Ohm, Sensitivity of 88 dB SPL, with necessary mounting bracket**

**Approved Makes – Bose, Music-Group/Turbo sound, JBL**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Box Type Speaker and shall have the following minimum specification  |  |  |
| Frequency Response (+/-3 dB)- 100 Hz - 16 kHz<br>Frequency Range (+/-10 dB)- 90 Hz - 16 kHz<br>Sensitivity (SPL / 1 W @ 1 m) - ≥ 88 dB<br>Nominal Coverage Pattern (H x V)- Minimum 60° x 60°<br>Power Handling- Minimum 100W<br>Nominal Impedance- 8 Ω<br>Driver Compliment: >5.25" to 8" or better |  |  |
| <b>Construction</b>  |  |  |
| Enclosure- ABS<br><br>Grille -Perforated steel, powder-coated finish, black or white<br><br>Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-11 Specification for Box type speaker with Minimum 40 Watts @ 6/8 ohms with necessary mounting Accessories**

**Approved Makes – Bose, Tannoy, JBL**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Box Type Speaker and shall have the following minimum specification  |  |  |
| Frequency Response (+/-3 dB)- 95 Hz - 17 kHz<br>Frequency Range (+/-10 dB)- 75 Hz - 19 kHz<br>Sensitivity (SPL / 1 W @ 1 m) - 84 - 94 dB<br>Nominal Coverage Pattern (H x V)- <100° x 100°<br>Power Handling- Minimum 40W<br>Nominal Impedance- 6/8 Ω<br>Driver Compliment: > 4.5" |  |  |
| <b>Construction</b>  |  |  |
| Enclosure- ABS<br>Grille - Aluminium, Painted / Highly zinc-plated, finished in durable TGIC polyester powder coating<br>Weight-< 4.5 Kgs<br>Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-12 Specification for 15.7" Condenser Gooseneck Microphone with Shock Mount**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Wireless Lavalier Microphone a have the following minimum specification  |  |  |
| Transducer Type- Electret Condenser<br>Polar Pattern- Cardioid<br>Frequency Response (near field)- 50–17000 Hz<br>Sensitivity- -35 dBV/Pa (18 mV)<br>Nominal Impedance- <100ohm<br>Load Impedance- ≥170Ω |  |  |

|   |  |  |
|---|--|--|
| Signal to noise ratio / noise voltage- 66 dB  |  |  |
| Maxi. SPL- 107 dB   |  |  |
| Equivalent SPL- 25 dB [A]   |  |  |
| Current Consumption- 2 to 3mA   |  |  |
| Length- 12-15"  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-13 Specification for Wireless Microphone Receiver with Lavalier Microphone - 30mw RF output**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Wireless Lavalier Microphone a have the following minimum specification |  |  |
| Transducer Type- condenser (electret)   |  |  |
| Polar Pattern- Cardioid   |  |  |
| Frequency Response (near field)- 50 - 20KHz   |  |  |
| Load Impedance- 1.8 - 3.5K Ohms   |  |  |
| Signal to noise ratio / noise voltage- > 115 dB(A)  |  |  |
| Maxi. SPL- > 119 dB SPL   |  |  |
| Frequency Range(Receiver) - 606...648 MHz   |  |  |
| Transmission Range- ≥100m   |  |  |
| Weight- Maximum of 1Kg  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational                         |  |  |

**A-14 Specification for UHF Wireless Handheld Microphone with Receiver - 30mw Power Output**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Wireless Handled Microphone a have the following minimum specification  |  |  |
| Transducer Type- condenser (electret)<br><br>Polar Pattern- Cardioid<br><br>Frequency Response (near field)- 80 - 18000 Hz<br><br>Load Impedance- 1.8 - 3.5K Ohms<br><br>Signal to noise ratio / noise voltage- 70.5 dB to 115dB<br><br>Maxi. SPL- 140 to 155dB SPL<br><br>Frequency Range(Receiver) - 606...648 MHz<br><br>Transmission Range- ≥100m<br><br>Weight- Maximum of 1Kg |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-15 Specification for Antenna Splitter in the frequency range of 470 to 790 MHz and with two antenna inputs that are distributed to minimum four outputs**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Antenna Splitter have the following minimum specification   |  |  |
| Frequency Range- 470 – 790 MHz<br><br>Impedance- 50 Ω<br><br>Gain- 3.5 dB<br><br>Weight- ≤3.4Kgs<br><br>Input/Output Antenna Connector Type- BNC type |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-16 Specification for Passive 2-way combiner 470 -1000 MHz 50 Ohm for wireless systems**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be have the following minimum specification   |  |  |
| Frequency Range - 470 – 790 MHz<br><br>Impedance- 50Ω<br><br>Input Voltage range - Max. 80 mW RF input power per channel - 3.5 dB<br><br>Insertion Loss - 0.8 dB |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-17 Specification for Omni Directional Antenna UHF range between 470 to 790 MHz includes antenna amplifier, mounting kit & necessary Antenna cable**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be have the following minimum specification  |  |  |
| Connector Type - ¼" Patch panel<br><br>Signal Type - AES/EBU Signals (digital)<br><br>Contact Resistance - <10 mΩ<br><br>Dielectric strength- > 500 V ac <10 mΩ<br><br>Frequency range - DC to > 50 MHz<br><br>Handles Phantom Power - Yes<br><br>Insertion force - <20N<br><br>Withdrawal force- >10N<br><br>Life Time >10,000 cycles- Yes<br><br>48 balanced channels with fully PCB wired jack<br>24 front pairs and corresponding 24 rear pairs |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-18 Specification for 24port Normalised / half normalised 1/4" Modular Microphone patch panel**

**Approved Makes – Behringer, Neutrik, Samson**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be have the following minimum specification  |  |  |
| Connector Type - 1/4" Patch panel<br>Signal Type - AES/EBU Signals (digital)<br>Contact Resistance - <10 mΩ<br>Dielectric strength- > 500 V ac <10 mΩ<br>Frequency range - DC to > 50 MHz<br>Handles Phantom Power - Yes<br>Insertion force - <20N<br>Withdrawal force- >10N<br>Life Time >10,000 cycles- Yes<br>48 balanced channels with fully PCB wired jack<br>24 front pairs and corresponding 24 rear pairs |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-20 & A-22, A-23, A-24 Specification for Fixed / charsi based DSP with Full-fledged DSP blocks over Cobranet / Dante, necessary Inputs, Outputs, logic ports & fire interface control box**

**Approved Makes – Biamp, Bose**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit DSP shall be have the following minimum specification  |  |  |
| System Type- Fixed / charsi based DSP with Full-fledged DSP blocks over Cobranet / Dante.<br>Number of Balanced Mic / Line Inputs & Outputs- Including Expanders Input / Output configuration should suffice requirement of 16 Inputs /48 Output<br>Analog Inputs- 8 - 16 Mic/Line inputs<br>AEC Inputs- 8-16 |  |  |

|  |  |  |
|--|--|--|
| <p>VOIP Connection- Minimum of 1</p> <p>Analog Outputs- 8-16</p> <p>Frequency Response(at 1W, 20 Hz to 20 kHz)- 20Hz~20kHz ±0.4dB</p> <p>Output Impedance- 20 Ohms</p> <p>Phantham Power- +48 Vdc</p> <p>Total Harmonic Distortion (THD) (@ Full rated power, 20Hz-20kHz)- &lt; 0.006% @-4 dBu</p> <p>Maximum Input Level- +24dBu</p> <p>Maximum Output Level- +24dBu</p> <p>Control- Third-party control via RS-232 or TCP/IP</p> <p>Sampling Rate- 48kHz</p> <p>A/D - D/A Converters- 24-bit</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-25 Specification for 5 Port network switch for Dante/cobranet connectivity**

**Approved Makes – D-link, Cisco, NetGear**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be have the following minimum specification   |  |  |
| <p>Standards- IEEE 802.3 10BASE-T Ethernet (twisted-pair copper)<br/>ANSI/IEEE 802.3 NWay auto-negotiation, IEEE 802.3x flow control, IEEE 802.3u 100BASE-TX Fast Ethernet (twisted-pair copper), IEEE 802.3az EEE power saving</p> <p>Switching Fabric- ~ 1 Gbps switching fabric</p> <p>Protocol- CSMA/CD</p> <p>Data Transfer Rates- Ethernet 10 Mbps (half duplex), 20 Mbps (full duplex), Fast Ethernet 100 Mbps (half duplex), 200 Mbps (full duplex)</p> <p>Network Cable- CAT 5e</p> <p>LED Indicators- System, 1 through 5</p> <p>Security feature- Security slot</p> |  |  |



|   |  |  |
|---|--|--|
| RAM Buffer- 48 KB per device  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-26 Specification for 2 Channel Amplifier with minimum 15-25 Watts per Channel @ 8/4 Ohms**

|   |
|---|
| <b>Approved Makes – Crestron, Bose, RDL</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification  |  |  |
| Channels- 2<br><br>Rated Power Output (all channels driven)- >50Watts<br><br>Signal to Noise Ratio- 75dB 20Hz to 20kHz<br><br>THD at 1 kHz and 1 dB- > 0.7% 20Hz to 20kHz<br><br>Frequency Response- 20 Hz to 20 kHz (± 1 dB, 4 or 8 Ohms)<br><br>Impedence- 4/8 Omhs<br><br>Crosstalk- >60 dB<br><br>Input impedance- 10 kΩ unbalanced |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-27 Specification for Dual Channel Amplifier 60 Watts @ 8/4 Ohms**

|  |
|--|
| <b>Approved Makes – Labgruppen, Extron, Crestron</b> |
|--|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification |  |  |

|   |  |  |
|---|--|--|
| Channels- 2   |  |  |
| Rated Power Output (all channels driven)- >60Watts                                      |  |  |
| Signal to Noise Ratio- 80dB – 10dBV, 20Hz to 20kHz                                      |  |  |
| THD at 1 kHz and 1 dB- > 0.2% 20Hz to 20kHz   |  |  |
| Frequency Response- 5 Hz to 22 kHz @ +/-1dB   |  |  |
| Impedence- 8/4 Omhs   |  |  |
| Crosstalk- >60 dBA  |  |  |
| Input impedance- 10 kΩ unbalanced   |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-28 Specification for 4 Channel amplifier 240 /250W @70.7 Volts**

**Approved Makes – Bose, Labgruppen, Cloud**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification |  |  |
| Channels- 4  |  |  |
| Rated Power Output (Per channels driven)- >250 Watts                                       |  |  |
| Frequency Response- 20 Hz - 20 kHz, ± 0.2 dB   |  |  |
| THD at 1 kHz and 1 dB- < 0.01%   |  |  |
| Input Impedance- 20 kOhm   |  |  |
| Noise ratio- >112 dBA  |  |  |
| Cross Talk- <70 dB,  |  |  |
| Impedance- 70.7 Volts  |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational    |  |  |

**A-29 Specification for 8 Channel Amplifier 60 / 75 Watts @ 8/4 Ohms**

**Approved Makes – Labgruppen, Crestron, Crown**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification  |  |  |
| Channels- 8<br><br>Rated Power Output (Per channels driven)- 60 to 75 Watts<br><br>Frequency Response- 6.8 Hz to 20 kHz<br><br>THD at 1 kHz and 1 dB- <0.1% @ 1 kHz at 3 dB<br><br>Input Impedance- 20 kOhm<br><br>Noise ratio- >112 dBA<br><br>Cross Talk- <70 dB<br><br>Impedance- 4/8 Ohms |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-30 Specification for 8 Channel amplifier with 500-800W @ 4/2Ω, 1000-1200W@ 4/8 Ω**

|   |
|---|
| <b>Approved Makes – Bose, Labgruppen, Crown</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification  |  |  |
| Channels- 8/4<br><br>Rated Power Output (Per channels driven)- 500 to 800 Watts<br><br>Frequency Response- 20 Hz to 20 kHz +/- 0.05 dB<br><br>THD at 1 kHz and 1 dB- <0.5%<br><br>Input Impedance- 20 kOhm<br><br>Noise ratio- >108 dBA<br><br>Cross Talk- <> 65 dB<br><br>Gain- ~ 42 dB<br><br>Impedance- 70/100 Volts |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**A-31 Specification for 4 Channel amplifier with 250-300 W @ 8 Ω**

**Approved Makes – Bose, Labgruppen, Crown**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit Amplifier shall be have the following minimum specification   |  |  |
| Channels- 4<br><br>Rated Power Output (Per channels driven)- 250 - 300 Watts<br><br>Frequency Response- 20 Hz - 20 kHz (at 1 W and +/- 0.5 dB)<br><br>THD at 1 kHz and 1 dB- <0.1%<br><br>Input Impedance- 20 kOhm<br><br>Noise ratio- >102 dBA<br><br>Cross Talk- < > 65 dB<br><br>Gain- ~ 36 dB<br><br>Impedance- 8 Ohms |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-32 & 33 Specification for 32 Channel Digital Audio Mixing Console with built in / external MADI Card, Ethernet Version for the above Mixing console**

**Approved Makes – Soundcraft, Midas, Yamaha**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit Mixer shall be have the following minimum specification   |  |  |
| Input Processing Channels- 32 Input Channels, 8 Aux Channels, 8 FX Return Channels<br><br>Output Processing Channels- 16<br><br>16 aux buses, 6 matrices, main LRC- 100<br><br>Internal Effects Engines (True Stereo / Mono)- 16<br><br>Internal Show Automation (structured Cues / Snippets)- 500/100<br><br>Internal Total Recall Scenes (incl. Preamplifiers and Faders)- 100 |  |  |

|   |  |  |
|---|--|--|
| Signal Processing- 40-Bit Floating Point  |  |  |
| A/D Conversion (8-channel, 96 kHz ready)- 114 dB Dynamic Range (A-weighted)             |  |  |
| D/A Conversion (stereo, 96 kHz ready)- 120 dB Dynamic Range (A-weighted)                |  |  |
| Network Latency- 1.1ms  |  |  |
| I/O Latency (Console Input to Output)- 0.8ms  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-34 Specification for Vocal Wired Microphone - Cardioid**

**Approved Makes – Beyerdynamic , Sennheiser , Shure**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Wireless Lavalier Microphone a have the following minimum specification  |  |  |
| Transducer Type- Dynamic<br>Polar Pattern- Super Cardioid /Cardioid<br>Frequency Response (near field)- 50 – 15 KHz<br>Nominal Impedance- >600 Ohm<br>Connector – XLR<br>Weight- Maximum of 350g |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-35 Specification for Microphone Boom Stand**

**Approved Makes – K&M, Beyerdynamic, Sennheiser**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Microphone Boom Stand have the following minimum specification |  |  |

|  |  |  |
|--|--|--|
| <p>Boom arm - One-piece design</p> <p>Boom arm length- 840 mm</p> <p>Clamping- T-bar locking screw</p> <p>Material- steel</p> <p>Threaded Connector- 3/8"</p> <p>Type- black</p> <p>Boom arm- One-piece design</p> <p>Boom arm length- 840 mm</p> <p>Clamping- Steel</p> <p>Threaded connector- 3/8"</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-36 Specification for Microphone Table Stand**

**Approved Makes – K&M, Beyerdynamic, Sennheiser**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b></p> <p>The unit shall be Microphone Table Stand have the following minimum specification</p>   |  |  |
| <p>Base diameter - 130mm</p> <p>Height- 175mm</p> <p>Leg construction- Heavy round cast-iron base</p> <p>Material- Steel</p> <p>Special Features- Anti-vibration rubber insert for noise filtration; screw in threaded bolt</p> <p>Threaded connector- 3/8"</p> <p>Type- Black</p> <p>Base diameter- 130 mm</p> <p>Leg construction- Heavy round cast-iron base</p> <p>Material- Steel</p> <p>Special features- Anti-vibration rubber insert for noise filtration; screw</p> |  |  |

|   |  |  |
|---|--|--|
| in threaded bolt  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

**A-37 Specification for Molded Cable with XLR Connector - Minimum 4.6Mtr**

**Approved Makes – Belden , Beyerdynamic, Kramer**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Molded Cable with XLR Connector and shall have the following minimum specification |  |  |
| Molded cable with XLR Connector – Minimum 5 Mtr  |  |  |

**A-38 Specification for Molded Cable with XLR Connector - Minimum 7 Mtr**

**Approved Makes – Belden , Beyerdynamic, Kramer**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Molded Cable with XLR Connector and shall have the following minimum specification |  |  |
| Molded cable with XLR Connector –Minimum 7 Mtr   |  |  |

**A-39 Specification for Molded Cable with XLR Connector - 10 Mtr**

**Approved Makes – Belden , Beyerdynamic, Kramer**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Molded Cable with XLR Connector and shall have the following minimum specification |  |  |
| Molded cable with XLR Connector – Minimum 10 Mtr   |  |  |

**A-40 Specification for Table Top Audio Conference Unit with Wired Microphone Kit**

**Approved Makes – Cisco, Polycom, Avaya**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b><br/>The unit shall be Microphone Table Stand &amp; Wired Microphone Kit for Audio Conference have the following minimum specification</p>  |  |  |
| <p><b>Display:</b><br/>Size (pixels)- 255 x 128 (W x H)<br/><br/>LED - backlight with custom intensity control<br/><br/>Standard 12- key keypad<br/><br/>Context- dependent soft keys 4<br/><br/>Options- On-hook/Off-hook, redial, mute, volume up/down</p> <p><b>Audio Features:</b><br/>Audio Source- Loud Speaker<br/><br/>Frequency- 160-22,000 Hz<br/><br/>Volume- Adjustable to 88 dB at 1/2 meter peak volume<br/><br/>Network and Provisioning<br/>Ethernet - 10/100 Base-T<br/><br/>USB ports- Mini and regular USB 1.1<br/><br/>EX mic ports- Two Walta ports<br/><br/>IP Address Configuration- DHCP and Static IP</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-41 Specification for 4 - Channel Automatix mixer**

**Approved Makes – Shure, Biamp, BSS**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b><br/>The unit shall be 4 - Channel Automatix mixer have the following minimum specification</p> |  |  |



|  |  |  |
|--|--|--|
| <b>Display:</b><br>Frequency Response - 50 Hz to 20 kHz<br><br>Total Harmonic Distortion - < 0.1% at +4 dBu<br><br>CMMR - >70 dB at 1 kHz<br><br>Signal and Noise - (-123) dBV max.<br><br>Recover Time - 300 ms<br><br>Phantom Power - 12 Vdc |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

**A-42 Specification for Portable audio system consists of powered 8" powered speakers ( pair ) with 8 channel mixer and one wired microphone**

**Approved Makes – BOSE, Tannoy, JBL**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Portable audio system consists of powered 8" powered speakers ( pair ) with 8 channel mixer and one wired microphone have the following minimum specification   |  |  |
| <b>Display:</b><br>System - Portable 2-way full range loudspeakers with powered mixer<br><br>Maximum SPL Output - 121 dB peak<br><br>Frequency Range(-10 dB) - 60 Hz~20 kHz<br><br>Frequency Response(+/-3 dB) - 70 Hz~18 kHz<br><br>AMP design - Class D<br>System power rating - 300 W (2x150 W stereo)<br>Output Connector - 2 x 1/4" TS (unbalanced) amplifier<br><b>MIXER</b><br>Input connector - 6 inputs (4 mono MIC/Line, 2 x Stereo)<br>Hi-Z Selection - 1 no of channel has a Hi-Z selection used for Guitar signal input<br>Output Connectors - Subwoofer Out, a 1/4" balanced<br><b>SPEAKER</b><br>LF Driver - 1x 203mm(8")woofer<br>HF Driver - 1x 1" Neodymium black Aluminum tweeter<br>Coverage Pattern - 100° x 60°<br>Crossover Frequency - 2 kHz<br>Crossover type - 2-way passive network 2nd order (12dB cutoff per octave) |  |  |

|   |  |  |
|---|--|--|
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational |  |  |

## B. Video System:

### B-1 Specification for 32" LED LCD Display with minimum 1 HDMI, VGA, VGAA, USB and RS232 Connectivity and Built in Speakers

**Approved Makes – Panasonic, Samsung, LG**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 32" LED LCD Display with minimum 1 HDMI, VGA, VGAA and RS232 Connectivity and Built in Speakers and have the following minimum specification  |  |  |
| Screen Size (Diagonal)-32"<br><br>Resolution -1920x1080 (16:9)<br><br>Brightness - Minimum 350 nits<br><br>Contrast Ratio -1400 : 1<br><br>Viewing Angle (Horizontal/Vertical)-178°/178°<br><br>Orientation-Landscape<br><br>Response Time-8 to 12 ms<br><br>Input-HDMI, VGA, VGAA<br><br>External Control-RS232/RJ45<br><br>Audio - Built in Speaker-20W (8W x 2), RCA Pin Type x 2<br><br>Operating Time-16x7<br><br>Maximum Power Consumption-<80W |  |  |

|  |  |  |
|--|--|--|
|  |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |

**B-2 Specification for 48/49" Full HD LED LCD Display with minimum 1 HDMI, VGA, VGAA and RS232 Connectivity and Built in Speakers**

|  |
|--|
| <b>Approved Makes – Panasonic, Samsung, LG</b> |
|--|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 48/49" Full HD LED LCD Display with minimum 1 HDMI, VGA, VGAA and RS232 Connectivity and Built in Speakers and have the following minimum specification   |  |  |
| Screen Size (Diagonal)- 48/49"<br><br>Aspect Ratio-16:9<br><br>Panel Type-IPS/Direct LED<br><br>Resolution-1920 x 1080(16:9)<br><br>Viewing Angle (CR>10) (Horizontal / Vertical)-178 x 178<br><br>Orientation-Landscape<br><br>Response Time-8ms to 12 ms<br><br>Input-HDMI, VGA, VGAA<br><br>External Control-RS232/RJ45<br><br>Audio - Built in Speaker-20w(10w+10w)<br><br>Brightness-Minimum 350 nits<br><br>Maximum Power Consumption-<150 Watts<br><br>Operating Time-16 x 7 |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-3 Specification for 65" Full HD LED Display with minimum 350 Cd/m2, HDMI X 2, DVI X 1, VGA X 1, RS232 X 1, Video IN X 1, RJ45 LAN X 1, Audio IN X 1, Audio Out x 1, 20W in built speakers**

**Approved Makes – Panasonic, Samsung, LG**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <p><b>Performance</b><br/>                 The unit shall be 65" Full HD LED Display with minimum 350 Cd/m2, HDMI X 2, DVI X 1, VGA X 1, RS232 X 1, Video IN X 1, RJ45 LAN X 1, Audio IN X 1, Audio Out x 1, 20W in built speakers and have the following minimum specification</p>   |  |  |
| <p>Screen Size (Diagonal)-65"</p> <p>Aspect Ratio-'16:9</p> <p>Resolution-1920 x 1080</p> <p>Response Time-8 ms</p> <p>Viewing Angle (Horizontal / Vertical)-178 x 178</p> <p>Orientation- Landscape</p> <p>Input-HDMI, VGA,VGAA</p> <p>External Control-RS232</p> <p>Audio - Built in Speaker-20 W [10 W+10 W]</p> <p>Operating Time-16 /7</p> <p>Brightness- minimum 350 nits</p> <p>Maximum Power Consumption-&lt;350W</p> |  |  |
| <b>Construction</b>   |  |  |
| <p>Unit should have relevant mounting and required connector accessories to make system operational</p>   |  |  |

**B-4 Specification for Universal flat screen wall mount bracket with tilt supports minimum 70Kgs weight upto 80" display**

**Approved Makes – B-Tech, Chief, SMS**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Universal flat screen wall mount bracket with tilt supports minimum 70Kgs weight upto 80" display and have the following minimum specification |  |  |
| Screen Size- up to 80" (140cm)<br><br>Maximum Weight -70kg (154lbs)<br><br>Tilt-+/- 15°<br><br>Mounting bracket should have VESA compatibility with the respective displays            |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-5 Specification for Flat Screen Wall Mount with Tilt to support up to 42" (107cm) / 25kg (55lbs)**

**Approved Makes – B-Tech, Chief, SMS**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Flat Screen Wall Mount with Tilt to support up to 42" (107cm) / 25kg (55lbs) and have the following minimum specification          |  |  |
| Screen Size- up to 42" (107cm)<br><br>Maximum Weight -25kg (55lbs)<br><br>Tilt-+/- 15°<br><br>Mounting bracket should have VESA compatibility with the respective displays |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-6 Specification for Low Level Flat Screen Trolley with Adjustable tilt & fixed positions of 0°, -22.5°, -45°, -67.5° and -90° up to 65" (165cm) / 70kg (154lbs)**

**Approved Makes – B-Tech, Chief,SMS**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Low Level Flat Screen Trolley with Adjustable tilt & fixed positions of 0°, -22.5°, -45°, -67.5° and -90° up to 65" (165cm) / 70kg (154lbs) and have the following minimum specification |  |  |
| Screen Size- up to 65" (107cm)<br><br>Maximum Weight -70kg (154lbs)<br><br>Tilt-+/- 15° to 45°<br><br>Mounting bracket should have VESA compatibility with the respective displays   |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-7 Specification 94" Diagonal Motorized projection screen with minimum 100 to 400mm black drop and LVC**

**Approved Makes – Draper, Dalite, Stewart**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 94" Diagonal Motorized projection screen with minimum 100 to 400mm black drop and LVC and have the following minimum specification  |  |  |
| <p>Screen Size - 94" 16:10 format</p> <p>Screen Type – Motorised</p> <p>Surface material - Matt white</p> <p>Motor shall be UL Certified with 220 -240 Volts AC 50 HZ,</p> <p>Three wire Instantly Reversible, Life time lubricated with Pre-set. Accessible Limit Switches.</p> <p>Multiple Station Control rated 220 Volts AC 50 Hz with 3 Position rocker switches with cover plates to stop Screen at Any point. Automatic Override allows only one signal to reach to motor when operates simultaneously</p> <p>Operating - LVL (Module Operating with 3 button contact Momentary closure)</p> <p>Necessary Black drop should be considered to make system to be operational</p> |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-8 Specification 109" Diagonal Motorized projection screen with 400mm black drop and LVC**

**Approved Makes – Draper, Dalite, Stewart**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 109" Diagonal Motorized projection screen with 400mm black drop and LVC and have the following minimum specification                |  |  |
| <p>Screen Size - 109" 16:10 format</p> <p>Screen Type – Motorised</p> <p>Surface material - Matt white</p> <p>Motor shall be UL Certified with 220 -240 Volts AC 50 HZ,</p> |  |  |

|  |  |  |
|--|--|--|
| <p>Three wire Instantly Reversible, Life time lubricated with Pre-set. Accessible Limit Switches.</p> <p>Multiple Station Control rated 220 Volts AC 50 Hz with 3 Position rocker switches with cover plates to stop Screen at Any point. Automatic Override allows only one signal to reach to motor when operates simultaneously</p> <p>Operating - LVL Module Operating with 3 button contact Momentary closure</p> <p>Necessary Black drop should be considered to make system to be operational</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-9 Specification 137" Diagonal Motorized projection screen with 200mm black drop and LVC**

|   |
|---|
| <b>Approved Makes – Draper, Dalite, Stewart</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b></p> <p>The unit shall be 137" Diagonal Motorized projection screen with 200mm black drop and LVC and have the following minimum specification</p> <p>Screen Size - 137" 16:10 format</p> <p>Screen Type – Motorised</p> <p>Surface material - Matt white</p> <p>Motor shall be UL Certified with 220 -240 Volts AC 50 HZ,</p> <p>Three wire Instantly Reversible, Life time lubricated with Pre-set. Accessible Limit Switches.</p> <p>Multiple Station Control rated 220 Volts AC 50 Hz with 3 Position rocker switches with cover plates to stop Screen at Any point. Automatic Override allows only one signal to reach to motor when operates simultaneously</p> <p>Necessary Black drop should be considered to make system to be operational</p> <p><b>B-10-137" Diagonal Motorized projection Wall / Ceiling Mounted screen with 600mm black drop and LVC</b></p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |



**B-11 Specification 392" Diagonal Motorized projection Tensioned screen with 1000 mm black drop and LVC with necessary motorized winch**

|  |
|--|
| <b>Approved Makes – Draper, Dalite</b> |
|--|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be 392" Diagonal Motorized projection Tensioned screen with 1000 mm black drop and LVC with necessary motorized winch and have the following minimum specification  |  |  |
| <p>Screen Size - 392" 16:10 format</p> <p>Screen Type – Motorised</p> <p>Surface material - Matt white</p> <p>Motor shall be UL Certified with 220 -240 Volts AC 50 HZ,</p> <p>Three wire Instantly Reversible, Life time lubricated with Pre-set. Accessible Limit Switches.</p> <p>Multiple Station Control rated 220 Volts AC 50 Hz with 3 Position rocker switches with cover plates to stop Screen at Any point. Automatic Override allows only one signal to reach to motor when operates simultaneously</p> <p>Necessary Black drop should be considered to make system to be operational</p> |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-12 Specification for 3500 - 4000 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens**

**Approved Makes – Panasonic, Sony, Casio**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 3500-4000 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens and have the following minimum specification   |  |  |
| Aspect Ratio-16:10<br>Brightness-3500-4000 ANSI<br>Contrast Ratio –Maxi.20000:1<br>Pixels- Minimum 2073600(1920 x 1200) pixels<br>Display Type -1 DLP Projection System / 3LCD<br>Inputs-HDMI, VGA<br>Control-RS232/ RJ-45<br>Power Supply -100-240V AC, 5.2-2.0A, 50/60Hz<br>Maxi. Power Consumption-<500Watts<br>Operating Temperature- 0 degree – 45 degree<br>Operating Humidity - 20-80%<br>Light Source – Laser<br>Projection Screen Size(Diagonal)- (40-300)inch |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-13 Specification for 5000-5400 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens**

|   |
|---|
| <b>Approved Makes – Panasonic, Sony, Christie</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 5000-5400 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens and shall have the following minimum specification   |  |  |
| Aspect Ratio-16:10<br><br>Brightness-5000-5400 ANSI<br><br>Contrast Ratio -20000:1<br><br>Pixels-Minimum 2,304,000 (1920 × 1200 )<br><br>Display Type -1 DLP Projection System / 3 LCD<br><br>Inputs-HDMI, VGA<br><br>Control-RS232/ RJ45<br><br>Power Supply -100-240V AC, 50/60Hz<br><br>Maxi. Power Consumption-800W<br><br>Operating Temperature- 0 degree – 45 degree<br><br>Operating Humidity - 10-80%<br><br>Light Source – Laser diode<br><br>Projection Screen Size(Diagonal)- (40-300)inch |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-14 Specification for 13000- 14000ANSI Lumens WUXGA Laser Projector with HDMI, VGA and RS232 control with suitable zoom lens**

|  |
|--|
| <b>Approved Makes – Panasonic, Christie, Barco</b> |
|--|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 13000 - 14000ANSI Lumens WUXGA Laser Projector with HDMI, VGA and RS232 control with suitable zoom lens and shall have the following minimum specification  |  |  |
| Aspect Ratio-16:10<br><br>Brightness-13000 – 14000 ANSI<br><br>Contrast Ratio –Maximum 7500:1<br><br>Pixels- Minimum (1920 × 1200)<br><br>Display Type - Laser phosphor<br><br>Inputs-HDMI, DVI-D<br><br>Control-RS232, RJ45<br><br>Power Supply -100-240V AC, 50/60Hz<br><br>Operating Temperature- 0 degree – 40 degree<br><br>Operating Humidity - 10-85%<br><br>Light Source – Laser phosphor |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-15 Specification for Minimum 8x4 HDMI Matrix switcher with RS232 , Ethernet & IR with necessary Extenders / Converters and mounting accessories**

**Approved Makes – Kramer, Extron, Crestron**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Minimum 8x4 HDMI Matrix switcher with RS232 , Ethernet & IR with <b>necessary Extenders / Converters and mounting accessories</b> and shall have the following minimum specification |  |  |
| Input- 8 HDMI / CAT with relevant trans-receivers<br><br>Output - 4 HDMI / CAT with relevant trans-receivers<br><br>Resolution – minimum 1080p<br><br>Control – RS232 / LAN<br><br>Maximum Data rate - 6.75Gbps              |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-16 Specification for Minimum 4 X 1 HDMI Auto Switcher**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Minimum 4 X 1 HDMI Auto Switcher with <b>necessary Extenders / Converters and mounting accessories</b> and shall have the following minimum specification |  |  |
| Input- 4 HDMI<br><br>Output - 1 HDMI<br><br>Resolution – minimum 1920 x 1080p<br><br>Control – RS232 / LAN<br><br>Maximum Data rate - 2.75Gbps  |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-17 Specification for Minimum 4 X 4 HDMI matrix switcher**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Minimum 4 X 4 HDMI matrix switcher with <b>necessary Extenders / Converters and mounting accessories</b> and shall have the following minimum specification |  |  |
| Input- 4 HDMI<br><br>Output - 4 HDMI<br><br>Resolution – minimum 1080p<br><br>Control – RS232 / LAN<br><br>Maximum Data rate - 6.75Gbps   |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-18 Specification for 16 x16 Matrix switcher Chassis with Serial Control Gateway and necessary mounting accessories**

|  |
|--|
| <b>Approved Makes – Kramer, Extron, Crestron</b> |
|--|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be 16 x16 Matrix switcher Chassis with Serial Control Gateway and necessary mounting accessories and shall have the following minimum specification  |  |  |
| Video<br><br>Switcher – 16x16 digital matrix, modular input cards and factory-configurable outputs<br><br>Input Signal Types - Configurable via modular plug-in cards supporting HDMI, HDBaseT, CAT & H.264 streaming<br><br>Output Signal Types - Configurable via factory-installed output cards supporting CAT, HDBaseT, HDMI, & H.264 streaming<br><br>Formats – HDMI, HDBaseT, or CAT w/Deep Color, HDCP content protection support;<br><br>AUDIO<br><br>Formats - Refer to the specifications for each input and output card<br><br>Communications<br><br>Ethernet - 10/100/1000 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, DHCP |  |  |

|  |  |  |
|--|--|--|
| USB- USB signal routing via select input cards, transmitters, receivers, and extenders; USB computer console port for setup<br><br>HDBaseT- HDCP, EDID, PoH, Ethernet<br><br>HDMI- HDCP, EDID, CEC<br><br>Power Consumption <4000Watts |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-19 Specification for Minimum 2 Input HDBaseT input card with required Qty sufficient to accommodate No. of HDBaseT inputs**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Minimum 2 Input HDBaseT input card with required Qty sufficient to accommodate No. of HDBaseT inputs and shall have the following minimum specification   |  |  |
| Video<br><br>Input Signal Types - CAT5e twisted-pair<br><br>Output Signal Types- HDMI OUT<br><br>connector<br><br>Formats – HDBaseT, & HDMI with Deep Color & 3D; HDCP content<br><br>Input Resolutions, Progressive - Minimum 1920 x 1200 @60Hz<br><br>Input Resolutions, Interlaced - minimum 1920x1200@60HZ (1080i30)<br><br>Backplane Data Rate - Minimum 12.5 Gbps<br><br>AUDIO<br><br>Digital-To-Analog Conversion - 24-bit 48 kHz<br><br>Frequency Response - 20Hz to 20kHz ±0.5dB;<br><br>S/N Ratio - >95dB, 20Hz to 20kHz A-weighted<br><br>Volume Gain Range (Analog) - -80dB to 0dB .<br><br>Output Impedance - 100 Ohms nominal |  |  |

|  |  |  |
|--|--|--|
| No. of cards should be sufficient to complete the system.  |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |

**B-20 Specification for 2 Input HDMI input card with required Qty sufficient to accommodate No. of HDMI inputs**

**Approved Makes – Kramer, Extron, Crestron**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be 2 Input HDMI input card with required Qty sufficient to accommodate No. of HDMI inputs and shall have the following minimum specification  |  |  |
| <p>Input Signal Types - HDMI w/Deep Color, 3D, &amp; 4K</p> <p>Output Signal Types - HDMI w/Deep Color, 3D</p> <p>Audio</p> <p>Input Signal Types - HDMI</p> <p>Output Signal Types- HDMI, analog stereo</p> <p>Digital-To-Analog Conversion - 24-bit 48 kHz</p> <p>Analog Volume Adjustment - -80 dB to 0 dB</p> <p>Frequency Response: 20 Hz to 20 kHz <math>\pm 0.5</math> dB;</p> <p>S/N Ratio-&gt;95 dB, 20 Hz to 20 kHz A-weighted</p> <p>THD+N- &lt;0.005% @ 1 kHz;</p> <p>HDMI - HDCP 2.2 , EDID, CEC</p> <p>No. of cards should be sufficient to complete the system.</p> |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-21 Specification for 2 output HDBaseT output card with required Qty sufficient to accommodate No. of HDBaseT outputs**



**Approved Makes – Kramer, Extron, Crestron**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be 2 output HDBaseT output card with required Qty sufficient to accommodate No. of HDBaseT outputs and shall have the following minimum specification   |  |  |
| Video<br><br>Signal Types - CAT type twisted pair copper wire, HDBaseT, HDMI<br><br>Resolutions, Progressive – minimum 1080p<br><br>Resolution, Interlaced – minimum 1080i<br><br>Audio<br><br>Signal Types - CAT, HDBaseT, HDMI should be HDCP, EDID, CEC complian<br><br>No. of cards should be sufficient to complete the system. |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-22 Specification for 2 Output HDMI output card with Analog Audio out with required Qty sufficient to accommodate No. of HDMI outputs**

**Approved Makes – Kramer, Extron, Crestron**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be 2 Output HDMI output card with Analog Audio out with required Qty sufficient to accommodate No. of HDMI outputs and shall have the following minimum specification   |  |  |
| Video<br><br>Signal Types-HDMI<br><br>Resolutions, Progressive – minimum 1080p<br><br>Resolution, Interlaced – minimum 1080i<br><br>Audio<br><br>Signal Types - HDMI, Analog Stereo<br><br>Digital-To-Analog Conversion-24-bit to 48 kHz<br><br>Frequency Response- 20Hz to 20kHz ±0.5 dB<br><br>S/N Ratio- >95 dB |  |  |

|  |  |  |
|--|--|--|
| THD+N- <0.005% @ 1kHz  |  |  |
| Stereo Separation- >90 dB  |  |  |
| HDMI- HDCP, EDID, CEC  |  |  |
| No. of cards should be sufficient to complete the system.  |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |

**B-23 Specification for Box Transmitter with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr**

**Approved Makes – Kramer, Lightware**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Box Transmitter with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr and shall have the following minimum specification        |  |  |
| Input- 1 HDMI connector<br>Output - 1 HDBaseT twisted pair RJ-45 connector<br>Ports – 1 IR and RS232<br>Baud Rate - 300 to 115200<br>Maximum Data rate - 10.2Gbps<br>Should be support upto 180mtr extension. |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-24 Specification for Wallplate type Transmitter with 1 HDMI & cat out output with necessary mounting bracket support upto 180mtr**

**Approved Makes – Kramer, Lightware**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Wallplate type Transmitter with 1 HDMI & cat out output with necessary mounting bracket support upto 180mtr and shall have the following minimum specification |  |  |

|  |  |  |
|--|--|--|
| Input- 1 HDMI connector<br>Output - 1 HDBaseT twisted pair RJ-45 connector<br>Maximum Data rate - 10.2Gbps<br>Should be support upto 180mtr extension. |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-25 Specification for Wallplate type Reciever with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr**

**Approved Makes – Kramer, Lightware**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Wallplate type Reciever with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr and shall have the following minimum specification |  |  |
| Input- 1 HDBaseT twisted pair RJ-45 connector<br>Output - 1 HDMI connector<br>Maximum Data rate - 10.2Gbps<br>Should be support upto 180mtr extension.   |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-26 Specification for Box type Reciever with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr**

**Approved Makes – Kramer, Lightware**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Box type Reciever with 1 HDMI & RS232 with cat out output with necessary mounting bracket support upto 180mtr and shall have the following minimum specification |  |  |

|  |  |  |
|--|--|--|
| Input- 1 HDBT on an RJ-45 female connector<br>Output - 1 HDMI on an HDMI connector<br>Ports – RS232<br>Baud Rate - 300 to 115200<br>Maximum Data rate - 10.2Gbps<br>Should be support upto 180mtr extension. |  |  |
| Construction   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-27 Specification for HDMI Cat5e Box Type Transmitter runs up to 70mtr**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI Cat5e Box Type Transmitter runs up to 70mtr and shall have the following minimum specification |  |  |
| Input - 1 HDMI<br>Output- 1 HDBT on an RJ45 female connector<br>Bandwidth- 4.95Gbps – 9.2Gbps<br>HDMI – HDCP 2.2                            |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-28 Specification for HDMI over Cat5e Box Type receiver runs up to 70mtr**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI Cat5e Box Type Transmitter runs up to 70mtr and shall have the following minimum specification |  |  |
| Input - 1 RJ-45<br>Output- 1 HDMI connector   |  |  |

|  |  |  |
|--|--|--|
| Bandwidth- 4.95Gbps – 9.2Gbps<br>HDMI – HDCP 2.2   |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |

**B-29 Specification for VGA to HDMI Scaler**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be VGA to HDMI Scaler and shall have the following minimum specification                       |  |  |
| Input - 1 VGA<br><br>Output- 1 HDMI connector<br><br>Input Resolution- minimum 1080i @50/60Hz<br><br>Processing Delay-<30ms approx. |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational                                    |  |  |

**B-30 Specification for HDMI Audio De-Embedder**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI Audio De-Embedder and shall have the following minimum specification   |  |  |
| Input – 1 HDMI, 1 Analog stereo audio<br><br>Output - 1 HDMI, 1 Analog stereo audio, 1 Digital Audio<br><br>Maximum data rate - 8.91Gbps<br><br>Maximum resolution- 4K@60Hz (4:2:0) |  |  |
| <b>Construction</b>   |  |  |

|  |  |  |
|--|--|--|
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |
|--|--|--|

**B-31 Specification for Wireless Presentation Box**

|  |
|--|
| <b>Approved Makes – Kramer, Extron, Crestron</b> |
|--|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be Wireless Presentation Box and shall have the following minimum specification   |  |  |
| I/O – USB 3.0, 1 LAN on an RJ-45 connector<br><br>GRAPHIC OUTPUTS - 1 HDMI<br><br>AUDIO OUTPUT - 3.5mm mini jack<br><br>PROCESSOR - Intel, Dual Core 1.04GHz or similar<br><br>STORAGE - minimum 32GB<br><br>LAN- Gigabit LAN<br><br>AUDIO- Analog or embedded HDMI<br><br>INPUT VOLTAGE-100V~220V AC, 50/60Hz, auto sensing |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational   |  |  |

**B-32 Specification for HD Desktop Visualizer with minimum 1 HDMI output, should be controlled manually and via In room control system**

|  |
|--|
| <b>Approved Makes – Wolfvision, Lumens</b> |
|--|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HD Desktop Visualizer with minimum 1 HDMI output, should be controlled manually and via In room control system and shall have the following minimum specification |  |  |
| Camera- 1-CMOS 1/3"<br><br>Pictures per second – 30 frames<br><br>Effective Pixels - 1920x1080  |  |  |

|  |  |  |
|--|--|--|
| Signal Output - 1080p HD (1920x1080)   |  |  |
| Zoom / Lens - minimum 12x zoom (6x optical, 2x digital)  |  |  |
| Light Source- LED  |  |  |
| I/O Connectors – HDMI, VGA, C-Video  |  |  |
| Control – RS232  |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational |  |  |

**B-33 Specification for PTZ Camera with HDMI and RS232 Connectivity**

|   |
|---|
| <b>Approved Makes – Panasonic, Sony, Vaddio</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall be PTZ Camera with HDMI and RS232 Connectivity and shall have the following minimum specification |  |  |
| Sensor- 1/2.3-type MOS   |  |  |
| Lens – Motorized 30x zoom, F1.6 to F4.7  |  |  |
| Focus Distance - 1.2 m (3.94 ft)   |  |  |
| Gain Selection - 0 dB to 48 dB   |  |  |
| Video Input-HDMI   |  |  |
| Video Output- USB  |  |  |
| Video Compression Format - Motion JPEG   |  |  |
| Resolution – minimum 1920 x 1080   |  |  |
| Frame Rate - minimum 30 fps  |  |  |
| Audio compression format- Linear PCM   |  |  |
| Resolution-JPEG, H.264   |  |  |
| Control – RS232  |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational                                       |  |  |

**B-34 – B-39 Specification for HDMI (M) to HDMI (M) Cable**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI (M) to HDMI (M) Cable and shall have the following minimum specification   |  |  |
| Data rates - Supports 10.2 Gbps<br><br>Vertical frequency- Supports up to 120 Hz<br><br>At 0.3 – 5.1 GHz: 5 - 25dB<br><br>Pair impedance- 100 ohms +/- 10 ohms<br><br>Connector- Type A HDMI male to Type A HDMI male<br><br>Conductor AWG- 28 AWG (7/0.127)<br><br>Cable length- 0.9mtr Standard HDMI (M) to HDMI (M) Cable<br>1.8mtr Standard HDMI (M) to HDMI (M) Cable<br>3mtr Standard HDMI (M) to HDMI (M) Cable<br>4.6mtr Standard HDMI (M) to HDMI (M) Cable<br>7.6mtr Standard HDMI (M) to HDMI (M) Cable<br>10.7mtr Standard HDMI (M) to HDMI (M) Cable |  |  |

**B-40 Specification for HDMI (M) to HDMI (M) Cable**

**Approved Makes – Kramer, Extron, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI (M) to HDMI (M) Cable and shall have the following minimum specification   |  |  |
| Data rates - Supports 18 Gbps<br><br>Vertical frequency- Supports up to 60 Hz<br><br>Pair impedance- 100 ohms +/- 10 ohms<br><br>Connector- Type A HDMI male to Type A HDMI male<br><br>Conductor AWG- 26 AWG (7/0.16)<br><br>Cable length- 15.2mtr Standard HDMI (M) to HDMI (M) Cable |  |  |

**B-41 Specification for HDMI Cable equalizer up to 30 mtr**



**Approved Makes – Kramer, Extron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be HDMI Cable equalizer up to 30 mtr and shall have the following minimum specification  |  |  |
| INPUT VIDEO SIGNAL - HDMI/DVI-TMDS<br><br>MAXIMUM SINGLE LINK – 1920x1200, 1080p<br><br>OUTPUT VIDEO - HDMI, HDCP1.0/1.1<br><br>HDMI INPUT/OUTPUT - Type A 19-pin<br><br>VIDEO AMPLIFIER – 1.65Gbps<br><br>OPERATING TEMPERATURE - 0°C to +70°C (32°F to 158°F)<br><br>OPERATING HUMIDITY - 10% to 85% RH (no condensation) |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-42 Specification for Blu-Ray Player**

**Approved Makes – Sony, Panasonic, LG**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall be Blu-Ray Player and shall have the following minimum specification   |  |  |
| Audio - Analog-to-Digital Converter : 192kHz/24bit<br><br>HDMI Output – 1<br><br>Optical / Coaxial - 1<br><br>USB Port - 1<br><br>Ethernet Port - 1 |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-43 Specification for AV Over IP Streaming Encoder with minimum 1 HDMI input and LAN connectivity**

**Approved Makes – Kramer, SVSI, Crestron**

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <p><b>Performance</b><br/>                 The unit shall be AV Over IP Streaming Encoder with minimum 1 HDMI input and LAN connectivity and have the following minimum specification</p>   |  |  |
| <p>Video Compression- JPEG2000</p> <p>Input Signal Types - HDMI</p> <p>Output Signal Types - LAN connector on an RJ-45 connector</p> <p>Session Initiation – Multicast</p> <p>Resolution – 1080P</p> <p>Bit depth – 10 to 36bit</p> <p>Latency - 17-ms to 90ms</p> <p>Color Sampling – Minimum 4:2:2</p> <p>Frame rate - Up to 60Hz</p> <p>Streaming Protocol – RTP/RTSP/SDP</p> <p>Ethernet Speed – 10/100/1000Mbps</p> <p>HDCP-Minimum HDCP 1.2</p> |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-44 Specification for AV Over IP Streaming Decoder with minimum 1 HDMI output and LAN connectivity**

**Approved Makes – Kramer, SVSI, Crestron**

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <p><b>Performance</b><br/>                 The unit shall AV Over IP Streaming Decoder with minimum 1 HDMI output and LAN connectivity and LAN connectivity and have the following minimum specification</p> |  |  |

|   |  |  |
|---|--|--|
| <p>Video Compression- JPEG2000</p> <p>Input Signal Types - LAN connector on an RJ-45 connector</p> <p>Output Signal Types - HDMI</p> <p>Session Initiation – Multicast</p> <p>Resolution – minimum 1080P</p> <p>Bit depth – 10 to 36bit</p> <p>Latency - 17-ms to 90ms</p> <p>Color Sampling – Minimum 4:2:2</p> <p>Frame rate - Up to 60Hz</p> <p>Streaming Protocol – RTP/RTSP/SDP</p> <p>Ethernet Speed – 10/100/1000Mbps</p> <p>HDCP-Minimum HDCP 1.2</p> |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

**B-45 Specification for STC of Control key pad with 2 RS232, 6 monteray relay, Ethernet monitor / control Two I/O**

|   |  |  |
|---|--|--|
| <b>Approved Makes – B-Tech, Chief</b>   |  |  |
| <b>Standard Compliance</b>  |  |  |
| <p><b>Performance</b></p> <p>The unit shall be STC of Control key pad with 2 RS232, 6 monteray relay, Ethernet monitor / control Two I/O and have the following minimum specification</p> |  |  |
| <p>Frequency response - 20 Hz to 3.3 kHz</p> <p>Sampling rate - 8 kHz</p> <p>Sample size - 16 bit</p> <p>Control – RS232, RJ45</p> <p>Audio latency – 30ms</p>                            |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and required connector accessories to make system operational  |  |  |

## C. Control System:

### C-1 Specification for 7" wired Touch panel with Table top docking station

|  |  |  |
|--|--|--|
| <b>Approved Makes – Crestron, AMX, Extron</b>  |  |  |
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall 7" wired Touch panel with Table top docking station shall have the following minimum specification  |  |  |
| Display Type- TFT Active matrix color LCD<br><br>Size- 7 inch (178 mm) diagonal<br><br>Aspect Ratio- 15:9 WVGA<br><br>Resolution- 1024 x 600 pixels<br><br>Brightness- 350 nits (cd/m <sup>2</sup> )<br><br>Contrast- 1100.01.00<br><br>Color Depth- 24-bit, 16.7M colors<br><br>Illumination- Edge lit LED<br><br>Viewing Angle- ±80° horizontal, ±80° vertical<br><br>Touch Screen- Projected capacitive, 5-point multi-touch capable<br><br>DDR3L RAM- 2 GB<br><br>Ethernet- 10/100 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, TCP/IP, UDP/IP, CIP, DHCP, SSL, TLS, SSH, SFTP (SSH File Transfer Protocol), IEEE 802.1X, SNMP, IPv4 or IPv6, IEEE 802.3af and 802.3at Type 1 compliant |  |  |
| <b>Construction</b>  |  |  |
| Unit should have relevant mounting and connector accessories required to be operational  |  |  |

### C-2 Specification for 10" wired touch panel with Table top docking station

|   |
|---|
| <b>Approved Makes – Crestron, AMX, Extron</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall 10" wired touch panel with Table top docking station shall have the following minimum specification  |  |  |
| <b>Touch Screen Display</b><br>Display Type-TFT Active matrix color<br>LCD Size-10.1 inch (257 mm) diagonal<br>Aspect Ratio-16:10 WXGA<br>Resolution-1280 x 800 pixels<br>Brightness-Approx. 400 nits (cd/m <sup>2</sup> )<br>Contrast-Approx. 950:1<br>Color Depth-24-bit, 16.7M colors<br>Illumination-Edgelit LED w /auto-brightness control<br>Viewing Angle-Approx. ±80° horizontal, ±80° vertical<br>Touch Screen-Projected Capacitive , 5-point multi-touch capable<br><br><b>Memory</b><br>RAM-2 GB<br><br>Storage-System: 4 GB eMMC<br><br>Maximum Project Size-600 MB<br><br><b>Video</b><br>Streaming Formats-H.264 (MPEG-4 part 10 AVC), MJPEG<br><br><b>Audio</b><br>Features-Built-in microphone and speakers, Rava SIP Intercom, multi-language voice recognition<br><br>Audio Feedback Formats-MP3<br><br>Connectors- LAN PoE-(1) 8-pin RJ45 with 2 LED indicators;-10Base-T/100Base-TX Ethernet port, Power over Ethernet compliantSeries Multi-Stage Protection |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**C-3 Specifications for Integrated Control Processor - 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support**

|   |
|---|
| <b>Approved Makes – Crestron, AMX, Extron</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall Integrated Control Processor - 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support shall have the following minimum specification   |  |  |
| The device shall be a 32 bit control processor should have a front panel LED display<br><br>COM Ports- Minimum 3<br><br>Serial Ports- Minimum 8<br><br>I/O Ports- Minimum 8<br><br>Relay Ports- Minimum 8<br><br>Ethernet- RJ45<br><br>SDRAM - 512MB<br><br>Flash card- 4 MB and can be able to extended up to 32 GB.<br><br>Temperature- Approx.32 degree to 122 degree F (5 degree to 50 degree C)<br><br>Power Consumption- Approx. 24 W |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

**C-4 Specifications for Integrated Control Processor - 6 RS232, 8 I/R/Serial Ports, 8 I/O, 8 Versi Isolated Relays, 10/100 Ethernet Port & with BACNET Support**

|   |
|---|
| <b>Approved Makes – Crestron, AMX, Extron</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall Integrated Control Processor - 6 RS232, 8 I/R/Serial Ports, 8 I/O, 8 Versi Isolated Relays, 10/100 Ethernet Port & with BACNET Support and shall have the following minimum specification  |  |  |
| SD RAM- 1 GB<br><br>Flash- 4 GB<br><br>Ethernet- 10/100/1000 Mbps; auto-switching; auto-negotiating; auto-discovery; full/half duplex; industry- standard TCP/IP stack; UDP/IP; CIP; DHCP; SSL; IEEE 802.1X; SNMP;standard TCP/IP stack; UDP/IP; CIP; DHCP; SSL; IEEE 802.1X; SNMP;<br><br>RS-232/422/485- For 2-way device control and monitoring, all ports support RS-232 up to 115.2k baud with software handshaking, two ports also support hardware handshaking, RS-422, and RS-485 |  |  |

|   |  |  |
|---|--|--|
| <p>IR/Serial- Supports 1-way device control via infrared up to 1.2 MHz or serial TTL/RS-232 (0-5 Volts) up to 115.2k baud</p> <p>LAN- 8 wire RJ45 jack</p> <p>10Base-T/100Base-TX/1000Base-T Ethernet port<br/>Connects to the customers LA</p> <p>COM 1 – 2--5-pin 3.5mm detachable terminal blocks;</p> |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

#### C-5 Specifications for IR Probe

|  |  |  |
|--|--|--|
| <b>Approved Makes – Crestron, AMX, Extron</b>  |  |  |
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall IR Probe have the following minimum specification |  |  |
| Connectors-2-pin 3.5mm detachable terminal block for connection to a IR port           |  |  |
| Enclosure-Black injection molded plastic with integral lightweight cable               |  |  |
| Cable Length-3ft (Mini Wired), 7ft long  |  |  |

#### C-6 Specifications for POE Injector

|  |  |  |
|--|--|--|
| <b>Approved Makes – Crestron, AMX, Extron</b>  |  |  |
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall POE Injector have the following minimum specification       |  |  |
| Output Rating- 350 mA maximum @ 48 Volts DC nominal  |  |  |
| Connectors LAN/LAN POE- RJ45, 10BaseT/100BaseTX, Ethernet<br>PoE Power Sourcing Equipment output |  |  |

## D. Video Conference

**D-1. & D-2. Specifications for Codec with 12x HD Camera and Remote control,1HDMI,1 HDMI or DVI-I selectable inputs with 2HDMI outputs & License with Multisite Option**

|   |  |  |
|---|--|--|
| <b>Approved Makes – Cisco, Polycom, Lifesize</b>  |  |  |
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall Integrated 12x HD Camera and Remote control,1HDMI,1 HDMI or DVI-I selectable inputs with 2HDMI outputs shall have the following minimum specification  |  |  |
| Resolution: 1920 x 1080 at 30 fps (1080p)<br><br>Audio input- 1 x microphone array input<br><br><b>Video standards and protocols</b><br>port .264, H.264 High Profile IP, H.263++, H.261-USB headset support<br>H.239/People + Content-1 x HDCI or HDMI (camera)<br>H.263 & H.264 Video Error Concealment-1 x HDMI<br>-1 x 3.5 mm stereo line-in<br><br>Video input- 1 x HDCI, 1xHDMI, 1 x VGA<br><br>Audio output- 1 x 3.5 mm stereo line-out<br><br>Video out- 2 x HDMI 1.3-Other<br><br>Interfaces, 2 x USB 2.0, 1 x RS-232<br><br>Resolutions Supported: HD (1920 x 1080i),HD (1920 x 1080p),<br><br>Output Resolution- WUXGA(1920 x 1200),HD (1920 x 1080)<br><br>Connectors:<br>Audio input-1 x microphone array input port -Network-USB headset support -IPV4,IPV6 support, 1 x 10/100/1G Ethernet Switch, Auto-MDIX, 1 x HDCI or HDMI (camera)-H.323 and/or SIP up to 6 Mbps , 1 x 3.5 mm stereo line, RS232<br><br>Pan range +/-100°<br><br>Tilt range- +20/-30°<br><br>Zoom-12x optical |  |  |
| <b>Construction</b>   |  |  |
| Unit should have relevant mounting and connector accessories required to be operational   |  |  |

## E. Installation Equipment

**E-1 Specification for Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes**



|   |
|---|
| <b>Approved Makes – Integrator Custom</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification   |  |  |
| <p>All plates shall be made from stainless steel or equal approved, minimum thickness is to be 1.6mm. Finish is to be brushed in non-public areas and finish to ID requirements in all public areas. Plate is to be clearly marked by engraving and black filled in paint, no other form of making will be acceptable. All connectors used in constructing plates shall be D series. All plates are to be mounted flush with surface and are to be aligned correctly.</p> <p>All plate designs are to be approved by the AV consultant before fabrication, sample of finish and detailed Drawings are to be provided.</p> |  |  |

**E-2 Specification for 6.25" Deep floor box + Plates**

|   |
|---|
| <b>Approved Makes – Legrand, FSR, CFM</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification   |  |  |
| <p>All plates shall be made from stainless steel or equal approved, minimum thickness is to be 6.25". Finish is to be brushed in non-public areas and finish to ID requirements in all public areas. Plate is to be clearly marked by engraving and black filled in paint, no other form of making will be acceptable. All connectors used in constructing plates shall be D series. All plates are to be mounted flush with surface and are to be aligned correctly.</p> <p>All plate designs are to be approved by the AV consultant before fabrication, sample of finish and detailed Drawings are to be provided.</p> |  |  |

**E-3 Specification for Ceiling Mount kit for Projector**

|   |
|---|
| <b>Approved Makes – Integrator Custom</b> |
|---|

|   |  |  |
|---|--|--|
| <b>Standard Compliance</b>  |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification   |  |  |
| The projector mount Bracket shall be made from mild steel or Stainless steel, can be custom made based on submitted drawings and shall be of a laser etched, matte black powder coat finish. Please note, all fixings shall be invisible from the front and all cable management shall be incorporated in the design of the unit. |  |  |

**E-4 Specification for 12 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required**

|   |
|---|
| <b>Approved Makes – Integrator Custom</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification  |  |  |
| <p>Equipment racks shall be constructed of 16 gauge (minimum) cold rolled steel &amp; shall have rear doors &amp; square front vertical corners. Rack dimensions shall not exceed 565mm Wide by 450mm Deep by 12 U high.</p> <p>Finish shall be approved by the AV consultant /Employer. The front Door shall have clear lockable (Minimum 5mm Thick) Perspex panel with minimum dimensions opening at strategic location to enable the operator to by Pass faulty equipment as necessary.</p> <p>Each rack shall be equipped with permanently mounted AC power 12 Conductor grounded Strip line rated for required power with no. of outlets, Extending the height of the rack &amp; with interior incandescent illumination Connected there to for ease in servicing &amp; connecting the installed components .Any unused panels mounting Space in the racks or enclosure shall be filled in with blank or ventilating Panels &amp; Shelves. If tenderer wishes to offer any other brand then fully specifications will be required.</p> <p>Proprietary Non-proprietary manufactured units are considered.</p> <p>to be approved by the AV consultant before fabrication, sample of finish led Drawings are to be provided.</p> |  |  |

**E-5 Specification for 18 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required**

|   |
|---|
| <b>Approved Makes – Integrator Custom</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification  |  |  |
| <p>Equipment racks shall be constructed of 16 gauge (minimum) cold rolled steel &amp; shall have rear doors &amp; square front vertical corners. Rack dimensions shall not exceed 800mm Wide by 650mm Deep by 18 U high.</p> <p>Finish shall be approved by the AV consultant /Employer. The front Door shall have clear lockable (Minimum 5mm Thick) Perspex panel with minimum dimensions opening at strategic location to enable the operator to by Pass faulty equipment as necessary.</p> <p>Each rack shall be equipped with permanently mounted AC power 12 Conductor grounded Strip line rated for required power with no. of outlets, Extending the height of the rack &amp; with interior incandescent illumination Connected there to for ease in servicing &amp; connecting the installed components .Any unused panels mounting Space in the racks or enclosure shall be filled in with blank or ventilating Panels &amp; Shelves. If tenderer wishes to offer any other brand then fully specifications will be required.</p> <p>Proprietary Non-proprietary manufactured units are considered.</p> <p>to be approved by the AV consultant before fabrication, sample of finished Drawings are to be provided.</p> |  |  |

**E-6 Specification for 42 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required**

|   |
|---|
| <b>Approved Makes – Integrator Custom</b> |
|---|

|  |  |  |
|--|--|--|
| <b>Standard Compliance</b>   |  |  |
| <b>Performance</b><br>The unit shall have the following minimum specification  |  |  |
| <p>Equipment racks shall be constructed of 16 gauge (minimum) cold rolled steel &amp; shall have rear doors &amp; square front vertical corners. Rack dimensions shall not exceed 800mm Wide by 650mm Deep by 42 U high.</p> <p>Finish shall be approved by the AV consultant /Employer. The front Door shall have clear lockable (Minimum 5mm Thick) Perspex panel with minimum dimensions opening at strategic location to enable the operator to by Pass faulty equipment as necessary.</p> |  |  |

|  |  |  |
|--|--|--|
| <p>Each rack shall be equipped with permanently mounted AC power 12 Conductor grounded Strip line rated for required power with no. of outlets, Extending the height of the rack &amp; with interior incandescent illumination Connected there to for ease in servicing &amp; connecting the installed components .Any unused panels mounting Space in the racks or enclosure shall be filled in with blank or ventilating Panels &amp; Shelves. If tenderer wishes to offer any other brand then fully specifications will be required.</p> <p>Proprietary Non-proprietary manufactured units are considered.</p> <p>To be approved by the AV consultant before fabrication, sample of finish and detailed Drawings are to be provided.</p> |  |  |
|--|--|--|

### **LIST OF APPROVED MAKES FOR ELCTRICAL SYSTEM**

Contractor shall use the materials of approved make as indicated below unless specified in BOQ or as approved by the HSCC electrical incharge. The contractor shall ensure the correct selection of the approved make meeting the specifications and application duties. Before placing order for procurement, the sample of approved make shall be got verified for its suitability to the specification and application duty. However, HSCC electrical engineer (approving authority) reserves the right to opt for the best preferred listed make. The contractor shall quote the rates for the material and equipment as per the list of approved makes. In the event of the contractor wants to use alternate makes other than those stipulated for any reason , the contractor can send a proposal after ensuring that what he proposes at the least meets both the quality and safety standard of the stipulated makes, and the financial benefit that will occur to the client. He shall also stand full guarantee to his alternate proposal. The alternate makes can be used only after an approval accorded by the client/HSCC., whose decision will be final in this matter. Any financial implication incurred related with inspection will be borne by contractor.

**Note- Approved Main LT Panel manufacture can use their Own Manufactured items for fabrication of panels. Authorized panel builders will not be accepted.**

| <b>S.No.</b> | <b>ITEM</b>                               | <b>MAKE</b>  |
|--------------|---|--|
| <b>1</b>     | 11 KV VCB Panel Board/ RMU                | Siemens/L&T/ABB/Schneider  |
| <b>1a</b>    | Packaged Type Sub-Station                 | Siemens/ ABB/ Schneider  |
| <b>2</b>     | Transformer                               | ABB/GE/ Schneider/Alstom   |
| <b>3</b>     | Main LT Panel/ APFC panels /Main AC panel | Siemens/ L&T/ABB/Schneider   |
| <b>4</b>     | Additional make for APFC Panel            | EPCOS  |
| <b>5</b>     | Synchronization Panel/AMF Panel           | OEM of the DG set or above panel manufacturer as mentioned against s.no.-3 |
| <b>6</b>     | Diesel Engine:                            | Cummins/ Caterpillar/MTU/ Perkins- Sterling                                |
| <b>7</b>     | Alternator:                               | Stamford/AVK/ Leroysoner/ KEC  |
| <b>8</b>     | Fastener                                  | Hilti/ Fisher or equivalent as approved by HSCC                            |
| <b>9</b>     | Anti-vibration mounting:                  | Dunlop, Gerb, resistoflex  |
| <b>10</b>    | Bus Duct/Rising main                      | L&T/ABB/Siemens/Schneider/GE/Legrand/C&S                                   |

- **Equivalent makes can be added with price adjustment with the prior approval of Engineer-in-charge**

|     |   |  |
|-----|---|--|
| 11. | Battery:  | Panasonic/Hitachi/Cummins/Exide  |
| 12. | Automatic Battery Charger:                          | Max Power/ Voltstat or equivalent as approved by HSCC  |
| 13  | MV panels/Fire panel/AHU Panel                      | Tricolite/Adlec./ Control & Switchgear /SPC Electro Tech Limited or equivalent as approved by HSCC |
| 14. | ACB   | L &T 'U' Power(Omega)/ Siemens 3WL/ ABB/ Legrand(DMX)/ Schneider (NW- Master Pact)/GE-Entelliguard |
| 15. | Moulded Case Circuit Breaker                        | L &T – (D sine/DL) / Siemens-VA/ ABB-TMA/ Schneider (Compact NSX)/Legrand-DPX                      |
| 16. | Power/auxiliary Contactors, timers, Relay, starters | ABB/ Schneider/ L&T/ Siemens   |
| 17. | AMF Relay   | wood ward/ Control & switchgear/   |
| 18. | SFU with HRC  | L&T/ Siemens/ ABB/ Schneider/GE  |
| 19. | Change over switches/Isolators                      | Schneider / Siemens/ABB/GE/L&T   |
| 20. | Instruments (Analog & Digital)                      | Conzerve/ L&T/ AE/ Siemens/ Minilec/ Rishab/ Schneider/ABB   |
| 21  | Timers  | Legrand/ L&T/ Siemens/ ABB BCH   |
| 22  | Cast resin current Transformers:                    | AE/ Kappa//L&T/ Rishab   |
| 23  | Selector Switches:                                  | L&T-Salzer/KAYCEE/ Siemens   |
| 24  | Push button, Indicating Lamps LED:                  | L&T-Esbee/Siemens/Schinder/Veshno/RAAS/ Rishab   |
| 25  | Auto manual changeover switches (3Way)              | Kaycee/L&T/ Schnieder/Siemens  |

- **Equivalent makes can be added with price adjustment with the prior approval of Engineer-in-charge**

|     |                             |   |
|-----|-----------------------------|---|
| 26  | MCB distribution Boards     | L &T/Hager/Legrand/ Siemens/ Schneider/GE /Havells/<br>Philips                |
| 27  | RCCB/MCB                    | L & T / Legrand-DX3/ Siemens / Schenider –Acti 9/GE/<br>Hager/Philips/Havells |
| 28  | HT/LT- XLPE cables          | Universal/Finolex/ Rallison or equivalent as approved by<br>HSCC              |
| 29  | Copper Control cable        | CCI/ Universal/Finolex/ Rallison or equivalent as<br>approved by HSCC         |
| 30  | Compression Glands & Lugs   | Comet/ Dowells or equivalent as approved by HSCC                              |
| 31  | PVC Tape                    | Steel Grip or equivalent as approved by HSCC                                  |
| 32  | Cable Jointing kit          | Raychem / 3M or equivalent as approved by HSCC                                |
| 33. | Cable Trays/ Raceways       | OBO/ Legrand/ Cooper/BEC  |
| 34  | Terminal Strips             | Elmex/ Connectwell/ Technoplast   |
| 35  | Light fitting               | Philips / GE/ Crompton Greaves/   |
| 36  | Fancy lights                | Kesalec Schreder/ Decon/ and above light fixture against<br>s.no.-35.         |
| 37  | LED light fitting & Fixture | Philips / GE/ Crompton Greaves.   |
| 38  | Lamps                       | Philips/ GE/CG/   |
| 39  | MS conduit                  | BEC/ AKG/ Steel Kraft or equivalent as approved by<br>HSCC                    |

- **Equivalent makes can be added with price adjustment with the prior approval of Engineer-in-charge**

|    |   |   |
|----|---|---|
| 40 | PVC conduit   | Supreme/Prince/Finolex/AKG or equivalent as approved by HSCC  |
| 41 | Conduit accessories MS & PVC  | As approved by HSCC   |
| 42 | Solar Power system  | TATA Power Solar, CEL, BHEL, BEL or equivalent as approved by HSCC  |
| 43 | Copper conductor PVC insulated wires, Co-axial , Telephone wires & cables | Finolex/ Havells/ L&T/ RR cable/ Skytone / Rallison/Batra Henlay/ Bonton/                                       |
| 44 | Additional make for telephone wire & cable                                | Delton  |
| 45 | Modular Switches & sockets Outlets  | Legrand-Myrius or Anti bacterial/L&T Oris/ Schneider - Livia / Philips -Sleek or equivalent as approved by HSCC |
| 46 | Metal clad Socket outlets With boxes                                      | L & T /Hager/ Siemens/ Schneider/ ABB/Legrand /HPL  |
| 47 | Lighting protection   | Erico/Galaxy electrode /Earth plus  |
| 48 | UPS system  | Schneider- MG , APC/ Etone Power ware/ Emerson  |
| 49 | High Mast poles   | Crompton Greaves/ Bajaj /Phillips or equivalent as approved by HSCC   |
| 50 | Electronic Ballast  | Philips/ GE/Crompton  |
| 51 | Ceiling /Wall mounted/exhaust Fan   | Crompton Greaves/ Orient/ Usha  |
| 52 | PC with CPU and monitor etc   | HP/ Compaq/Del  |
| 53 | Auto Transfer switch  | Cummins/Emerson-Asco/GE/ Russelectric   |
| 54 | Public address system   | Bosch/ Bose/ Honey well /Harman   |
| 55 | CCTV camera   | Honeywell/ Pelco /Bosch/Sony/Axis   |
| 56 | LCD/LED Monitor   | Sony/Panasonic/Samsung/ Toshiba   |
| 57 | Fire Detection System Addressable   | Honeywell-Notifier/Edward/Bosch/ Siemens  |

- **Equivalent makes can be added with price adjustment with the prior approval of Engineer-in-charge**



|    |   |   |
|----|---|---|
| 59 | FDA Conventional                                    | Honeywell/Bosch or equivalent as approved by HSCC   |
| 60 | Portable fire extinguisher                          | Minimax/Ceasefire/                                  |
| 61 | EPABX system  | Avaya/ Siemens-unify/Alcatel/Cisco                  |
| 62 | Nurse Call bell system                              | Category A: Honeywell/Schreak/ Rauland              |
| 63 | Capacitor   | Epcos, Schenider, L&T, Ducati                       |
| 64 | APFC Relay  | Epcos, L&T, Biluk, Ducati, Schneider                |
| 65 | Occupancy Sensor                                    | Philips/ Honeywell/ Schneider/Lutron/Legrand        |
| 66 | Lifts/ Dumb Waiters/Escalators                      | Otis /Kone/ Mitsubishi/ Scheindler/Johnson          |
| 67 | BMS, field devices etc                              | Honeywell-Trend/L&T-Atmos/Siemens/Schneider         |
| 68 | Lighting Control                                    | Lutron/ Philips/ ABB/ Schneider/ Legrand/ Honeywell |
| 69 | Chemical Earthing                                   | OBO Bettermann / Erico/Furse / Ingesco/             |
| 70 | Access Control System                               | Honeywell-Pro-3000/Schneider/Lenel/Cardex           |
| 71 | Boom barrier  | Magnetic/ Somfy/ RIB/FAAC                           |
| 72 | CAT 6 UTP, CAT 6A UTP/STP, Optical Fibre-cable etc. | Molex/Systimax/Panduit                              |

- **Equivalent makes can be added with price adjustment with the prior approval of Engineer-in-charge**

END OF TECHNICAL SPECIFICATION

# DETAILED SPECIFICATIONS

## SYSTEM DESIGN DATA

### 1.0 GENERAL

The system design, basis of design, estimated requirements and other relevant data are outlined in this section.

### 2.0 LOCATION

Proposed Hospital & Academic Campus at “AIIMS, GUNTUR”.

### 3.0 SCOPE OF WORK

3.1 The work proposed under this tender includes supply, installation, testing & commissioning of Central Air-conditioning systems for the proposed Hospital and Academic Campus and as detailed in the technical specifications and schedule of prices.

### 4.0 BASIS OF DESIGN

#### 4.1 Assumptions

Following assumptions have been made for calculation of air-conditioning cooling load:

- a) Fresh air : As per ASHRAE 170 and 62.1.
- b) Window glazing : Single/double pane glass
- c) Lighting load : 1.1 W/ Sq. ft
- d) Occupancy : As per attached table / as per seating plan.
- e) Equipment load : As per attached Table /as per medical equipment.
- f) Roof Insulation : The exposed roof of air-conditioned areas shall be insulated by other agencies.

All non AC areas in corridors and lobbies where ducts are crossing/return being taken to have 50 mm thick insulated boxing.

- g) Electrical power supply: 415v/3ph/50Hz, AC power supply
- h) Humidity control : Not considered
- i) Glass : SHGC- 0.25  
U-Value- 2.8 W/m<sup>2</sup>-K for DGU

j) Wall : U-Value 0.35 W/m<sup>2</sup>-K

#### 4.2 Design Considerations :

- All the equipments etc. shall be suitable for 415 V, three phases or 220 V, Single phase, 50 Hz A.C. supply.
- Energy efficient chillers, VF drive for motors, Insulation of roof for reducing heat ingress & reducing load on AC, Double glazing of windows on sun facing side, Air tight windows and doors for reducing leakage of air and dust.
- All HVAC equipments and systems shall comply with the mandatory provisions of ECBC, 2017.
- Natural ventilation shall comply with the design guidelines provided for natural ventilation in the National Building Code of India 2016.
- Cooling equipments shall meet or exceed the minimum efficiency requirements laid down in ECBC, 2017.
- Where ever used, the Unitary Air conditioners will meet IS 1391 (part-I), split air conditioner shall meet IS 1391 (Part –II), Packaged air conditioner shall meet IS 8148.
- All cooling towers will have VFD controlled motors controlling the fans as prescribed in ECBC, 2017.
- All HVAC system will be balanced in accordance with provision of ECBC, 2017.

#### 4.3 OUTSIDE AMBIENT CONDITIONS

| Season   | Dry Bulb temp | Wet Bulb temp. |
|----------|---------------|----------------|
| SUMMER:  | 110 deg F DB  | 83 deg F WB    |
| MONSOON: | 94 deg F DB   | 82 deg F WB    |
| WINTER:  | 55 deg F DB   | 49 deg F WB    |

#### INSIDE CONDITIONS

|               |   |
|---------------|---|
| For All areas | 74+/- 2 deg F & RH not exceeding 55%.     |
| For OTs       | 70 +/- 2 deg F DB & RH not exceeding 50%. |
| For ICU       | 72+/- 2 deg F DB & RH not exceeding 50%.  |

#### 5.0 ESTIMATED LOAD

On the basis of data given above, the estimated load for the air conditioning system is Summarised below:-

### **HEAT LOAD SUMMARY - IPD BLOCK**

| S.No.          | DESCRIPTION                     | AREA          | TOTAL OCCUPANCY | LIGHT LOAD    | EQPT. LOAD as per med. Eq. | EQPT. LOAD (diversified) | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air    |
|----------------|---------------------------------|---------------|-----------------|---------------|----------------------------|--------------------------|------------------|-------------------|-------------------------|--------------------------|--------------|
|                |                                 | SQFT          | Nos.            | WATT          | kW                         | HP                       | TR               | TR                | CFM                     | CFM                      | CFM          |
|                |                                 |               |                 |               |                            |                          |                  |                   |                         |                          |              |
| <b>LEVEL 0</b> |                                 |               |                 |               |                            |                          |                  |                   |                         |                          |              |
| 1              | Laboratory Service              | 15522         | 155             | 17074         |                            | 31.2                     | 66.2             | 58.8              | 18809                   | 15861                    | 5100         |
| 2              | Administration                  | 13778         | 276             | 15156         |                            | 27.7                     | 60.3             | 54.9              | 16178                   | 14286                    | 4520         |
| 3              | Discharge Lounge & Café         | 9914          | 128             | 10905         |                            | 19.9                     | 37.8             | 34.9              | 8917                    | 8146                     | 3252         |
| 4              | Dialysis                        | 13778         | 85              | 15156         |                            | 27.7                     | 54.5             | 48.7              | 14621                   | 12517                    | 4520         |
| 5              | Admitting Service (PAT + LAB)   | 14435         | 144             | 15878         |                            | 29.0                     | 60.9             | 54.2              | 17146                   | 14518                    | 4734         |
| 6              | IPD Lobby                       | 10441         | 100             | 11485         |                            | 14.0                     | 48.4             | 43.7              | 11932                   | 10390                    | 4202         |
| 7              | Waiting area -21 Elevator side  | 10764         | 200             | 11840         |                            | 14.4                     | 45.8             | 40.9              | 11949                   | 10060                    | 3530         |
| 8              | Waiting area-1 Elevator Side    | 9903          | 220             | 10893         |                            | 13.3                     | 47.4             | 41.3              | 13953                   | 11180                    | 3248         |
| 9              | Casulty Beds                    | 13046         | 190             | 14351         |                            | 26.2                     | 51.0             | 47.0              | 12225                   | 11148                    | 4280         |
| 10             | Trauma Beds                     | 15070         | 220             | 16577         | 20                         | 26.8                     | 56.4             | 52.8              | 12544                   | 11976                    | 4942         |
| 11             | Waiting area                    | 4198          | 136             | 4618          |                            | 5.6                      | 23.2             | 21.6              | 7374                    | 6820                     | 1377         |
| 12             | Womens Imaging                  | 18783         | 220             | 20661         | 20                         | 26.8                     | 68.1             | 63.2              | 14894                   | 13871                    | 6160         |
| 13             | Imaging                         | 17438         | 110             | 19181         | 875                        | 469.2                    | 171.0            | 164.7             | 82914                   | 80859                    | 5720         |
| 14             | MRI- 1                          | 807           | 4               | 888           | 20                         | 26.8                     | 8.8              | 8.6               | 4413                    | 4356                     | 265          |
| 15             | MRI - 2                         | 807           | 4               | 888           | 20                         | 26.8                     | 8.8              | 8.6               | 4413                    | 4356                     | 265          |
|                | <b>Total</b>                    | <b>168683</b> | <b>2192</b>     | <b>185551</b> |                            | <b>786</b>               | <b>808.5</b>     | <b>744.0</b>      | <b>252285</b>           | <b>230345</b>            | <b>56115</b> |
| <b>LEVEL 1</b> |                                 |               |                 |               |                            |                          |                  |                   |                         |                          |              |
| 1              | Cafeteria                       | 6674          | 445             | 7341          |                            | 31.3                     | 59.6             | 51.7              | 23474                   | 19213                    | 2190         |
| 2              | EVS                             | 1668          | 33              | 1835          |                            | 4.5                      | 8.3              | 7.3               | 2568                    | 2568                     | 547          |
| 3              | Linen Laundry                   | 5091          | 51              | 5601          |                            | 13.6                     | 27.0             | 23.7              | 7479                    | 6345                     | 1922         |
| 4              | Bio Medical Shop                | 6308          | 126             | 6938          |                            | 16.9                     | 33.8             | 29.0              | 11306                   | 8984                     | 2070         |
| 5              | Waiting area 27 Elevator side   | 11195         | 224             | 12314         |                            | 15.0                     | 47.0             | 40.8              | 14387                   | 11685                    | 3672         |
| 6              | Morgue                          | 4790          | 48              | 5269          |                            | 9.6                      | 22.5             | 19.2              | 7166                    | 5550                     | 1570         |
| 7              | Class room                      | 3014          | 158             | 3315          |                            | 6.1                      | 20.3             | 18.5              | 6926                    | 6082                     | 988          |
| 8              | ICU S.S                         | 15177         | 110             | 16695         |                            | 61.0                     | 82.7             | 69.9              | 26746                   | 21365                    | 4978         |
| 9              | Casulty Beds & Invansive cardio | 13304         | 110             | 14635         |                            | 26.8                     | 52.9             | 47.4              | 13982                   | 11958                    | 4367         |
| 10             | Casulty Bed With                | 13304         | 120             | 14635         |                            | 26.8                     | 49.6             | 45.1              | 10282                   | 9421                     | 4367         |

| S.No. | DESCRIPTION                  | AREA  |      | TOTAL OCCUPANCY | LIGHT LOAD | EQPT. LOAD as per med. Eq. | EQPT. LOAD (diversified) | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air |
|-------|------------------------------|-------|------|-----------------|------------|----------------------------|--------------------------|------------------|-------------------|-------------------------|--------------------------|-----------|
|       |                              |       |      |                 |            |                            |                          |                  |                   |                         |                          |           |
|       |                              | SQFT  | Nos. |                 |            |                            |                          |                  |                   |                         |                          |           |
|       | Medication                   |       |      |                 |            |                            |                          |                  |                   |                         |                          |           |
| 11    | Casulty Beds Lower           | 13304 | 110  | 14635           |            |                            | 26.8                     | 56.6             | 50.3              | 16357                   | 13832                    | 4367      |
| 12    | Gen. ICU Beds                | 15285 | 110  | 16813           |            |                            | 61.5                     | 83.3             | 70.7              | 30506                   | 24235                    | 5013      |
| 13    | Endoscopy Procedure Waiting  | 6135  | 80   | 6749            |            |                            | 8.2                      | 31.7             | 27.6              | 10748                   | 8803                     | 2012      |
| 14    | Aneasthesia                  | 11948 | 200  | 13143           |            |                            | 16.0                     | 50.1             | 44.6              | 13106                   | 10933                    | 3918      |
| 15    | Packing Room                 | 15845 | 100  | 17429           |            |                            | 21.2                     | 65.4             | 58.2              | 18554                   | 15715                    | 5197      |
| 16    | Corridor -1                  | 4736  | 158  | 5210            |            |                            | 6.3                      | 25.2             | 22.1              | 6373                    | 5259                     | 1787      |
| 17    | Corridor - 2                 | 8966  | 299  | 9863            |            |                            | 12.0                     | 60.6             | 52.4              | 22639                   | 18432                    | 2940      |
| 18    | CATH 1,2                     | 1905  | 16   | 2096            | 12         |                            | 16.1                     | 18.7             | 17.2              | 3805                    | 3522                     | 1875      |
| 19    | VASC & EP LAB                | 1905  | 16   | 2096            |            |                            | 7.7                      | 16.6             | 15.2              | 2532                    | 2249                     | 1875      |
| 20    | IMG Guided                   | 818   | 8    | 1000            |            |                            | 13.4                     | 14.1             | 13.1              | 2771                    | 2626                     | 1153      |
| 21    | SP.OT 1                      | 775   | 8    | 1000            | 10         |                            | 13.4                     | 13.4             | 12.5              | 2647                    | 2549                     | 1093      |
| 22    | SP.OT 2                      | 775   | 8    | 1000            | 10         |                            | 13.4                     | 13.4             | 12.5              | 2647                    | 2549                     | 1093      |
| 23    | SP.OT 3                      | 775   | 8    | 1000            | 10         |                            | 13.4                     | 13.2             | 12.3              | 2500                    | 2458                     | 1093      |
| 24    | SP.OT 4                      | 775   | 8    | 1000            | 10         |                            | 13.4                     | 13.2             | 12.3              | 2500                    | 2458                     | 1093      |
| 25    | SP.OT 5 ( Burns OT assumed ) | 775   | 8    | 1000            | 10         |                            | 13.4                     | 8.6              | 7.7               | 1547                    | 1522                     | 1093      |
| 26    | SP.OT 6                      | 840   | 8    | 1000            | 10         |                            | 13.4                     | 36.5             | 33.7              | 2572                    | 2503                     | 3948      |
| 27    | MJ.OT 1 ( Burns OT assumed ) | 646   | 8    | 1000            | 10         |                            | 13.4                     | 8.1              | 7.2               | 1638                    | 1542                     | 911       |
| 28    | MJ.OT 2                      | 646   | 8    | 1000            | 10         |                            | 13.4                     | 12.1             | 11.3              | 2790                    | 2636                     | 911       |
| 29    | MJ.OT 3                      | 646   | 8    | 1000            | 10         |                            | 13.4                     | 12.1             | 11.3              | 2790                    | 2636                     | 911       |
| 30    | MJ.OT 4                      | 646   | 8    | 1000            | 10         |                            | 13.4                     | 12.1             | 11.3              | 2790                    | 2636                     | 911       |
| 31    | MJ.OT 5                      | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 32    | MJ.OT 6                      | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 33    | MJ.OT 7                      | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 34    | MJ.OT 8                      | 775   | 8    | 1000            | 10         |                            | 13.4                     | 34.0             | 31.4              | 2557                    | 2493                     | 3644      |
| 35    | MJ.OT 9                      | 646   | 8    | 1000            | 10         |                            | 13.4                     | 11.6             | 11.0              | 2478                    | 2444                     | 911       |
| 36    | MJ.OT 10                     | 646   | 8    | 1000            | 10         |                            | 13.4                     | 11.6             | 11.0              | 2478                    | 2444                     | 911       |
| 37    | MJ.OT 11                     | 646   | 8    | 1000            | 10         |                            | 13.4                     | 11.6             | 11.0              | 2478                    | 2444                     | 911       |
| 38    | MJ.OT 12                     | 646   | 8    | 1000            | 10         |                            | 13.4                     | 11.6             | 11.0              | 2478                    | 2444                     | 911       |
| 39    | MJ.OT 13                     | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 40    | MJ.OT 14                     | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 41    | MJ.OT 15                     | 710   | 8    | 1000            | 10         |                            | 13.4                     | 12.4             | 11.7              | 2489                    | 2451                     | 1002      |
| 42    | MJ.OT 16                     | 775   | 8    | 1000            | 10         |                            | 13.4                     | 13.2             | 12.3              | 2500                    | 2458                     | 1093      |
| 43    | Sterile Core 1               | 1227  | 2    | 1350            |            |                            | 3.3                      | 14.4             | 12.8              | 1887                    | 1417                     | 1730      |
| 44    | Sterile Core 2               | 1722  | 2    | 1894            |            |                            | 4.6                      | 19.1             | 17.3              | 1939                    | 1603                     | 2430      |
| 45    | Sterile Core 3               | 1722  | 2    | 1894            |            |                            | 4.6                      | 19.1             | 17.3              | 1939                    | 1603                     | 2430      |

| S.No. | DESCRIPTION                 | AREA          |             | TOTAL OCCUPANCY | LIGHT LOAD | EQPT. LOAD as per med. Eq. | EQPT. LOAD (diversified) | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air |
|-------|-----------------------------|---------------|-------------|-----------------|------------|----------------------------|--------------------------|------------------|-------------------|-------------------------|--------------------------|-----------|
|       |                             |               |             |                 |            |                            |                          |                  |                   |                         |                          |           |
|       |                             | SQFT          | Nos.        |                 |            |                            |                          |                  |                   |                         |                          |           |
| 46    | Sterile Core 4              | 1518          | 2           | 1669            |            | 4.1                        | 16.8                     | 15.2             | 1712              | 1416                    | 2140                     |           |
| 47    | OT Corridor-1               | 1851          | 5           | 2037            |            | 5.0                        | 15.1                     | 13.7             | 1932              | 1657                    | 1822                     |           |
| 48    | OT, Corridor-2              | 1851          | 5           | 2037            |            | 5.0                        | 15.1                     | 13.7             | 1932              | 1657                    | 1822                     |           |
| 49    | OT, Corridor-3              | 1765          | 5           | 1942            |            | 4.7                        | 14.5                     | 13.1             | 1846              | 1584                    | 1740                     |           |
| 50    | Endoscopy                   | 926           | 9           | 1018            |            | 1.9                        | 8.6                      | 7.5              | 1531              | 1142                    | 911                      |           |
|       | <b>Total</b>                | <b>189651</b> | <b>2730</b> | <b>213453</b>   |            | <b>729</b>                 | <b>1259.8</b>            | <b>1124.0</b>    | <b>320743</b>     | <b>273778</b>           | <b>99283</b>             |           |
|       | <b>LEVEL 2</b>              |               |             |                 |            |                            |                          |                  |                   |                         |                          |           |
| 1     | Pharmacy                    | 8148          | 81          | 8963            |            | 16                         | 36.0                     | 32.0             | 9405              | 7903                    | 2980                     |           |
| 2     | Material Management         | 13627         | 30          | 14990           |            | 27                         | 55.4                     | 50.1             | 16003             | 14138                   | 4480                     |           |
| 3     | IT Support                  | 5619          | 60          | 6181            |            | 11                         | 27.9                     | 23.9             | 9316              | 7369                    | 1840                     |           |
| 4     | Office Upper                | 11905         | 80          | 13095           |            | 24                         | 52.3                     | 45.5             | 15911             | 12900                   | 3900                     |           |
| 5     | Asso. Prof                  | 6566          | 110         | 7223            |            | 13                         | 29.0                     | 25.8             | 8120              | 6844                    | 2150                     |           |
| 6     | HOD & Work Station          | 8568          | 132         | 9425            |            | 17                         | 42.8                     | 38.5             | 13811             | 12061                   | 2810                     |           |
| 7     | Meeting room & Work station | 10011         | 150         | 11012           |            | 20                         | 49.5                     | 43.5             | 15887             | 13226                   | 3280                     |           |
| 8     | Office Lower                | 16630         | 100         | 18293           |            | 33                         | 70.2                     | 61.6             | 20551             | 16945                   | 5450                     |           |
|       | <b>Total</b>                | <b>81074</b>  | <b>743</b>  | <b>89182</b>    |            | <b>163</b>                 | <b>363.1</b>             | <b>320.9</b>     | <b>109004</b>     | <b>91386</b>            | <b>26890</b>             |           |
|       | <b>LEVEL 3</b>              |               |             |                 |            |                            |                          |                  |                   |                         |                          |           |
| 1     | S.S & GEN PEDS ( BEDS )     | 21646         | 174         | 23811           |            | 43.5                       | 112.2                    | 93.7             | 39354             | 30049                   | 7100                     |           |
| 2     | NICU                        | 13003         | 110         | 14303           |            | 26.1                       | 72.4                     | 60.6             | 24263             | 18451                   | 4860                     |           |
| 3     | Waiting Area Lower          | 6458          | 110         | 7104            |            | 8.7                        | 27.7                     | 22.7             | 10844             | 8105                    | 1300                     |           |
| 4     | Birthing Centre             | 13390         | 110         | 14729           | 130        | 87.1                       | 81.0                     | 71.4             | 31630             | 27046                   | 4392                     |           |
| 5     | C- Section                  | 1184          | 8           | 1302            | 20         | 26.8                       | 12.8                     | 11.3             | 6356              | 5552                    | 388                      |           |
| 6     | Waiting Area Upper          | 5866          | 110         | 6453            |            | 7.9                        | 26.6                     | 21.8             | 10260             | 7662                    | 1275                     |           |
| 7     | S.S & GEN BEDS              | 13003         | 110         | 14303           |            | 26.1                       | 71.9                     | 59.9             | 24710             | 18709                   | 4675                     |           |
| 8     | GYN & OB BEDS               | 21646         | 130         | 23811           |            | 43.5                       | 106.3                    | 89.1             | 36115             | 27664                   | 7100                     |           |
|       | <b>Total</b>                | <b>96198</b>  | <b>862</b>  | <b>105818</b>   |            | <b>270</b>                 | <b>510.9</b>             | <b>430.6</b>     | <b>183532</b>     | <b>143238</b>           | <b>31090</b>             |           |
|       | <b>LEVEL 4</b>              |               |             |                 |            |                            |                          |                  |                   |                         |                          |           |
| 1     | GEN BEDS LOWER              | 21646         | 190         | 23811           |            | 43.5                       | 94.3                     | 83.7             | 27889             | 23533                   | 7100                     |           |
| 2     | S.S BEDS LOWER              | 13003         | 110         | 14303           |            | 26.1                       | 61.5                     | 53.9             | 18157             | 14929                   | 4675                     |           |
| 3     | Waiting Area Lower          | 6458          | 110         | 7104            |            | 8.7                        | 22.0                     | 19.4             | 7349              | 6089                    | 1280                     |           |
| 4     | GEN BEDS                    | 14574         | 145         | 16032           |            | 29.3                       | 61.6                     | 55.6             | 18140             | 15904                   | 4600                     |           |
| 5     | Waiting area Upper          | 5866          | 110         | 6453            |            | 7.9                        | 21.6                     | 18.9             | 7090              | 5833                    | 1275                     |           |
| 6     | S.S BEDS UPPER              | 13003         | 110         | 14303           |            | 26.1                       | 61.5                     | 53.9             | 18157             | 14929                   | 4675                     |           |

| S.No. | DESCRIPTION        | AREA          |             | TOTAL OCCUPANCY | LIGHT LOAD | EQPT. LOAD as per med. Eq. | EQPT. LOAD (diversified) | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air     |
|-------|--------------------|---------------|-------------|-----------------|------------|----------------------------|--------------------------|------------------|-------------------|-------------------------|--------------------------|---------------|
|       |                    |               |             |                 |            |                            |                          |                  |                   |                         |                          |               |
|       |                    | SQFT          | Nos.        |                 |            |                            |                          |                  |                   |                         |                          |               |
| 7     | GEN BEDS UPPER     | 21646         | 190         | 23811           |            | 43.5                       | 92.6                     | 82.3             | 26792             | 22655                   | 7100                     |               |
|       | <b>Total</b>       | <b>96198</b>  | <b>965</b>  | <b>105818</b>   |            | <b>185</b>                 | <b>415.3</b>             | <b>367.8</b>     | <b>123573</b>     | <b>103871</b>           | <b>30705</b>             |               |
|       | <b>LEVEL 5</b>     |               |             |                 |            |                            |                          |                  |                   |                         |                          |               |
| 1     | GEN BEDS LOWER     | 21646         | 190         | 23811           |            | 43.5                       | 96.5                     | 84.7             | 30730             | 25525                   | 6750                     |               |
| 2     | S.S BEDS LOWER     | 13003         | 100         | 14303           |            | 26.1                       | 58.0                     | 51.0             | 17456             | 14464                   | 4340                     |               |
| 3     | Waiting area Lower | 6458          | 185         | 7104            |            | 8.7                        | 24.9                     | 22.2             | 8426              | 7169                    | 1250                     |               |
| 4     | ICU                | 14574         | 45          | 16032           |            | 29.3                       | 46.6                     | 42.0             | 15684             | 13879                   | 3180                     |               |
| 5     | Waiting area Upper | 5866          | 168         | 6453            |            | 7.9                        | 23.9                     | 21.3             | 7927              | 6671                    | 1270                     |               |
| 6     | S.S BED UPPER      | 13003         | 100         | 14303           |            | 26.1                       | 58.0                     | 51.0             | 17456             | 14464                   | 4340                     |               |
| 7     | GEN BED UPPER      | 21646         | 166         | 23811           |            | 43.5                       | 93.8                     | 82.3             | 29284             | 24298                   | 6750                     |               |
|       | <b>Total</b>       | <b>96198</b>  | <b>953</b>  | <b>105818</b>   |            | <b>185</b>                 | <b>401.8</b>             | <b>354.6</b>     | <b>126962</b>     | <b>106471</b>           | <b>27880</b>             |               |
|       | <b>LEVEL 6</b>     |               |             |                 |            |                            |                          |                  |                   |                         |                          |               |
| 1     | S.S BED LOWER      | 13003         | 110         | 14303           |            | 26.1                       | 64.3                     | 55.9             | 19912             | 16153                   | 4675                     |               |
| 2     | Waiting area Lower | 6458          | 185         | 7104            |            | 8.7                        | 26.4                     | 23.4             | 9305              | 7781                    | 1275                     |               |
| 3     | ICU                | 9322          | 45          | 10254           |            | 18.7                       | 43.5                     | 38.6             | 13722             | 11730                   | 3180                     |               |
| 4     | Waiting Area Upper | 5866          | 168         | 6453            |            | 8                          | 25.3                     | 22.2             | 8723              | 7225                    | 1280                     |               |
| 5     | S.S BEDS UPPER     | 13003         | 110         | 14303           |            | 26                         | 64.3                     | 55.8             | 19911             | 16152                   | 4670                     |               |
|       | <b>Total</b>       | <b>47652</b>  | <b>617</b>  | <b>52417</b>    |            | <b>88</b>                  | <b>223.8</b>             | <b>195.9</b>     | <b>71573</b>      | <b>59040</b>            | <b>15080</b>             |               |
|       | <b>Grand Total</b> | <b>775654</b> | <b>9063</b> | <b>858056</b>   |            | <b>1337</b>                | <b>2405</b>              | <b>3983</b>      | <b>3538</b>       | <b>1187672</b>          | <b>1008129</b>           | <b>287043</b> |

## HEAT LOAD SUMMARY – ACADEMIC BLOCKS

| SI. No. | DESCRIPTION                | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air   |
|---------|----------------------------|--------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|-------------|
|         |                            | SQFT         | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM         |
|         | <b>Library &amp; Admin</b> |              |                 |              |            |                  |                   |                         |                          |             |
|         | <b>GF</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 1       | Café                       | 3552         | 108             | 3907         | 16.7       | 15.0             | 13.5              | 8231                    | 7318                     | 1884        |
| 2       | Director Security          | 296          | 6               | 326          | 1.6        | 1.5              | 1.3               | 889                     | 726                      | 62          |
| 3       | Conference room            | 700          | 20              | 770          | 1.4        | 3.5              | 2.9               | 1997                    | 1577                     | 185         |
| 4       | Student affair offices     | 2594         | 40              | 2854         | 7.0        | 8.6              | 7.2               | 4507                    | 3748                     | 462         |
| 5       | Wel Come Center            | 3423         | 20              | 3765         | 9.2        | 10.9             | 8.8               | 6267                    | 5038                     | 397         |
| 6       | Director Finance           | 452          | 12              | 497          | 2.4        | 2.1              | 1.8               | 1102                    | 893                      | 113         |
| 7       | Director IT                | 522          | 12              | 574          | 2.8        | 2.3              | 1.9               | 1209                    | 980                      | 119         |
| 8       | Commons                    | 1152         | 33              | 1267         | 6.2        | 4.8              | 4.6               | 2416                    | 2305                     | 304         |
|         | <b>Sub Total</b>           | <b>12691</b> | <b>251</b>      | <b>13960</b> | <b>47</b>  | <b>49</b>        | <b>42</b>         | <b>26617</b>            | <b>22585</b>             | <b>3527</b> |
|         | <b>FF</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 9       | 24/7 Reading room          | 7589         | 176             | 8347         | 10.2       | 24.8             | 21.2              | 13683                   | 11366                    | 2308        |
| 10      | Conference room            | 301          | 10              | 332          | 0.6        | 2.0              | 1.5               | 1139                    | 838                      | 89          |
| 11      | Reading room & offices     | 4962         | 88              | 5458         | 6.7        | 14.6             | 12.6              | 8224                    | 6987                     | 1245        |
| 12      | Computer teaching room     | 624          | 22              | 687          | 5.4        | 3.2              | 2.9               | 1765                    | 1567                     | 192         |
| 13      | Director Offices           | 689          | 16              | 758          | 3.7        | 2.6              | 2.2               | 1630                    | 1352                     | 158         |
|         | <b>Sub Total</b>           | <b>14165</b> | <b>312</b>      | <b>15582</b> | <b>26</b>  | <b>47</b>        | <b>40</b>         | <b>26441</b>            | <b>22110</b>             | <b>3991</b> |
|         | <b>SF</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 14      | Offices                    | 2852         | 40              | 3138         | 15.3       | 12.8             | 10.9              | 7614                    | 6430                     | 482         |
| 15      | Board room                 | 872          | 20              | 959          | 4.7        | 5.4              | 4.6               | 3176                    | 2692                     | 198         |
| 16      | Reception                  | 1884         | 19              | 2072         | 0.7        | 4.9              | 3.7               | 2854                    | 2138                     | 269         |
| 17      | Directors Colab            | 1130         | 24              | 1243         | 6.1        | 4.5              | 3.8               | 2549                    | 2150                     | 244         |
|         | <b>Sub Total</b>           | <b>6738</b>  | <b>103</b>      | <b>7412</b>  | <b>27</b>  | <b>27.5</b>      | <b>23.1</b>       | <b>16193</b>            | <b>13410</b>             | <b>1194</b> |
|         |                            | <b>33594</b> | <b>666</b>      | <b>36954</b> | <b>100</b> | <b>123.5</b>     | <b>105.4</b>      | <b>69251</b>            | <b>58106</b>             | <b>8711</b> |
|         | <b>TFA-1</b>               |              |                 |              |            | <b>28.2</b>      | <b>25.4</b>       |                         |                          | <b>4046</b> |
|         | <b>TFA-2</b>               |              |                 |              |            | <b>32.5</b>      | <b>29.3</b>       |                         |                          | <b>4666</b> |
|         | <b>Total</b>               |              |                 |              |            | <b>184.3</b>     | <b>160.1</b>      |                         |                          |             |
|         | <b>Medical Lab</b>         |              |                 |              |            |                  |                   |                         |                          |             |
|         | <b>GF</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 18      | Medical Lecture Theatre    | 5124         | 240             | 5636         | 6.9        | 17.2             | 15.5              | 8158                    | 7092                     | 2740        |
| 19      | Conference & Imaging room  | 3139         | 90              | 3453         | 6.3        | 8.4              | 7.5               | 4298                    | 3730                     | 828         |



| SI. No. | DESCRIPTION                     | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air    |
|---------|---------------------------------|--------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|--------------|
|         |                                 | SQFT         | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM          |
|         | <b>Sub Total</b>                | <b>8262</b>  | <b>330</b>      | <b>9089</b>  | <b>13</b>  | <b>25.6</b>      | <b>23.1</b>       | <b>12456</b>            | <b>10822</b>             | <b>3567</b>  |
|         | <b>FF</b>                       |              |                 |              |            |                  |                   |                         |                          |              |
| 20      | Anatomy Lab                     | 2207         | 24              | 2427         | 11.8       | 6.9              | 5.9               | 3704                    | 3148                     | 1015         |
| 21      | Physiology Human Lab            | 2207         | 24              | 2427         | 11.8       | 5.6              | 5.2               | 2994                    | 2738                     | 1015         |
| 22      | Physiology Amphibian Lab        | 2207         | 24              | 2427         | 11.8       | 5.6              | 5.2               | 2994                    | 2738                     | 1015         |
| 23      | PHYSIOLOGY Clinical LAB         | 2185         | 24              | 2404         | 11.7       | 5.5              | 5.0               | 3171                    | 2832                     | 1005         |
| 24      | Demonstration room              | 2174         | 102             | 2392         | 5.8        | 7.7              | 7.1               | 3387                    | 3049                     | 833          |
|         | <b>Sub Total</b>                | <b>10979</b> | <b>198</b>      | <b>12077</b> | <b>53</b>  | <b>31</b>        | <b>28</b>         | <b>16251</b>            | <b>14504</b>             | <b>4883</b>  |
|         | <b>2nd F</b>                    |              |                 |              |            |                  |                   |                         |                          |              |
| 25      | Forensic Lab                    | 2207         | 24              | 2427         | 11.8       | 6.3              | 5.6               | 3391                    | 2967                     | 942          |
| 26      | Clinical Pathology Lab          | 2207         | 24              | 2427         | 11.8       | 5.2              | 4.9               | 2731                    | 2586                     | 942          |
| 27      | Pathology Lab For Morbid        | 2207         | 24              | 2427         | 11.8       | 5.2              | 4.9               | 2731                    | 2586                     | 942          |
| 28      | Medicine Museum                 | 2185         | 72              | 2404         | 2.9        | 5.7              | 5.2               | 2539                    | 2225                     | 638          |
| 29      | Path Demonstration room         | 2174         | 134             | 2392         | 5.8        | 8.9              | 8.4               | 4129                    | 3784                     | 1041         |
|         | <b>Sub Total</b>                | <b>10979</b> | <b>278</b>      | <b>12077</b> | <b>44</b>  | <b>31</b>        | <b>29</b>         | <b>15521</b>            | <b>14148</b>             | <b>4505</b>  |
|         | <b>3rd F</b>                    |              |                 |              |            |                  |                   |                         |                          |              |
| 30      | Microbiology Service Labs       | 2562         | 25              | 2818         | 13.7       | 6.6              | 6.0               | 3891                    | 3518                     | 1094         |
| 31      | Microbiology Tables             | 4370         | 72              | 4807         | 23.4       | 12.0             | 11.2              | 6749                    | 6246                     | 1865         |
| 32      | Bio chem Labs                   | 2174         | 24              | 2392         | 11.7       | 5.8              | 5.3               | 3409                    | 3064                     | 928          |
| 33      | Microbiology Demonstration room | 2153         | 103             | 2368         | 5.8        | 5.8              | 5.3               | 3664                    | 3319                     | 837          |
|         | <b>Sub Total</b>                | <b>11259</b> | <b>224</b>      | <b>12385</b> | <b>55</b>  | <b>30</b>        | <b>28</b>         | <b>17713</b>            | <b>16147</b>             | <b>4724</b>  |
|         | <b>4th F</b>                    |              |                 |              |            |                  |                   |                         |                          |              |
| 34      | Pharmacy                        | 2174         | 24              | 2392         | 2.9        | 4.2              | 3.5               | 2387                    | 1951                     | 927          |
| 35      | Pharmacology Experimental       | 2174         | 24              | 2392         | 11.7       | 5.6              | 5.2               | 3252                    | 3009                     | 927          |
| 36      | Practical Lab                   | 2174         | 24              | 2392         | 11.7       | 6.3              | 5.6               | 3703                    | 3269                     | 927          |
| 37      | Community Demonstration room    | 2174         | 134             | 2392         | 5.8        | 9.4              | 8.7               | 4422                    | 3989                     | 1041         |
| 38      | Pharmacology Museum             | 2185         | 72              | 2404         | 2.9        | 6.2              | 5.5               | 3086                    | 2652                     | 638          |
|         | <b>Sub Total</b>                | <b>10882</b> | <b>278</b>      | <b>11971</b> | <b>35</b>  | <b>31.7</b>      | <b>28.5</b>       | <b>16851</b>            | <b>14869</b>             | <b>4460</b>  |
|         |                                 | <b>52363</b> | <b>1308</b>     | <b>57599</b> | <b>200</b> | <b>150.4</b>     | <b>136.8</b>      | <b>78791</b>            | <b>70490</b>             | <b>22139</b> |
|         | <b>TFA-1</b>                    |              |                 |              |            | <b>100.1</b>     | <b>90.0</b>       |                         |                          | <b>14351</b> |
|         | <b>TFA-2</b>                    |              |                 |              |            | <b>54.3</b>      | <b>48.8</b>       |                         |                          | <b>7789</b>  |

| SI. No. | DESCRIPTION                | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air    |
|---------|----------------------------|--------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|--------------|
|         |                            | SQFT         | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM          |
|         | <b>TFA Dissection Hall</b> |              |                 |              |            | <b>35.0</b>      | <b>31.0</b>       |                         |                          | <b>5000</b>  |
|         | <b>Total</b>               |              |                 |              |            | <b>339.8</b>     | <b>306.7</b>      |                         |                          |              |
|         | <b>Shared Labs</b>         |              |                 |              |            |                  |                   |                         |                          |              |
| 40      | <b>GF</b>                  |              |                 |              |            |                  |                   |                         |                          |              |
| 41      | Medical Lecture Theatre    | 5188         | 250             | 5707         | 7.0        | 16.8             | 15.5              | 7785                    | 6942                     | 2842         |
| 42      | Shared lab Left            | 3315         | 65              | 3647         | 17.8       | 9.8              | 9.0               | 5443                    | 4974                     | 1550         |
| 43      | Shared lab Right           | 3315         | 65              | 3647         | 17.8       | 9.8              | 9.0               | 5443                    | 4974                     | 1550         |
|         | <b>Sub Total</b>           | <b>11819</b> | <b>380</b>      | <b>13001</b> | <b>43</b>  | <b>36</b>        | <b>34</b>         | <b>18672</b>            | <b>16890</b>             | <b>5942</b>  |
|         | <b>FF</b>                  |              |                 |              |            |                  |                   |                         |                          |              |
| 44      | Lecture room               | 4370         | 183             | 4807         | 5.9        | 13.2             | 12.0              | 6245                    | 5495                     | 2125         |
| 45      | Lab Left                   | 3283         | 64              | 3611         | 17.6       | 9.9              | 9.1               | 5040                    | 4556                     | 1550         |
| 46      | Lab Right                  | 3283         | 72              | 3611         | 17.6       | 10.3             | 9.4               | 5146                    | 4662                     | 1550         |
|         | <b>Sub Total</b>           | <b>10936</b> | <b>319</b>      | <b>12030</b> | <b>41</b>  | <b>33</b>        | <b>30</b>         | <b>16431</b>            | <b>14712</b>             | <b>5225</b>  |
|         | <b>2nd F</b>               |              |                 |              |            |                  |                   |                         |                          |              |
| 47      | Class room                 | 2228         | 122             | 2451         | 3.0        | 6.1              | 5.4               | 3475                    | 3076                     | 1363         |
| 48      | Lab-Left                   | 4349         | 64              | 4784         | 23.3       | 12.9             | 11.7              | 6763                    | 6035                     | 1855         |
| 49      | Lab Right                  | 3283         | 60              | 3611         | 18         | 10.7             | 9.5               | 5495                    | 4850                     | 1400         |
| 50      | Computer teaching          | 1076         | 26              | 1184         | 5.8        | 3.5              | 3.2               | 1729                    | 1578                     | 253          |
|         | <b>Sub Total</b>           | <b>10936</b> | <b>272</b>      | <b>12030</b> | <b>50</b>  | <b>33.1</b>      | <b>29.8</b>       | <b>17462</b>            | <b>15539</b>             | <b>4871</b>  |
|         |                            | <b>33691</b> | <b>971</b>      | <b>37060</b> | <b>133</b> | <b>102.9</b>     | <b>93.8</b>       | <b>52565</b>            | <b>47140</b>             | <b>16039</b> |
|         | <b>TFA-1</b>               |              |                 |              |            | <b>57.1</b>      | <b>51.3</b>       |                         |                          | <b>8186</b>  |
|         | <b>TFA-2</b>               |              |                 |              |            | <b>54.8</b>      | <b>49.2</b>       |                         |                          | <b>7853</b>  |
|         | <b>Total</b>               |              |                 |              |            | <b>214.7</b>     | <b>194.4</b>      |                         |                          |              |
|         | <b>Medical College</b>     |              |                 |              |            |                  |                   |                         |                          |              |
|         | <b>GF</b>                  |              |                 |              |            |                  |                   |                         |                          |              |
| 51      | Conference rooms left      | 544          | 18              | 598          | 1.1        | 2.2              | 1.8               | 1170                    | 907                      | 159          |
| 52      | Conference rooms Right     | 544          | 18              | 598          | 1.1        | 2.2              | 1.8               | 1170                    | 907                      | 159          |
| 53      | Anatomy demonstration room | 2260         | 146             | 2486         | 6.1        | 9.9              | 9.1               | 4585                    | 4119                     | 1125         |
|         | <b>Sub Total</b>           | <b>3348</b>  | <b>182</b>      | <b>3682</b>  | <b>8</b>   | <b>14</b>        | <b>13</b>         | <b>6924</b>             | <b>5932</b>              | <b>1444</b>  |
|         | <b>FF</b>                  |              |                 |              |            |                  |                   |                         |                          |              |
| 54      | Lower Offices              | 1873         | 48              | 2060         | 10.0       | 7.0              | 6.1               | 3495                    | 3029                     | 458          |
| 55      | Upper Offices              | 1873         | 48              | 2060         | 10.0       | 5.4              | 4.8               | 3070                    | 2763                     | 458          |
| 56      | Waiting area               | 1884         | 24              | 2072         | 1.3        | 3.0              | 2.6               | 1501                    | 1234                     | 303          |
|         | <b>Sub Total</b>           | <b>5630</b>  | <b>120</b>      | <b>6193</b>  | <b>21</b>  | <b>15</b>        | <b>14</b>         | <b>8065</b>             | <b>7026</b>              | <b>1219</b>  |

| SI. No. | DESCRIPTION                   | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air   |
|---------|-------------------------------|--------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|-------------|
|         |                               | SQFT         | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM         |
|         | <b>2nd F</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 57      | Lower offices                 | 1873         | 48              | 2060         | 10.0       | 6.0              | 5.6               | 2948                    | 2713                     | 458         |
| 58      | Upper Offices                 | 1873         | 48              | 2060         | 10.0       | 5.9              | 5.5               | 2904                    | 2669                     | 458         |
| 59      | Waiting area                  | 1884         | 24              | 2072         | 1.3        | 2.1              | 2.1               | 1078                    | 1027                     | 303         |
|         | <b>Sub Total</b>              | <b>5630</b>  | <b>120</b>      | <b>6193</b>  | <b>21</b>  | <b>14</b>        | <b>13</b>         | <b>6929</b>             | <b>6409</b>              | <b>1219</b> |
|         | <b>3rd F</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 60      | Bio Chem. Demonstrartion room | 1087         | 64              | 1196         | 2.9        | 4.2              | 4.0               | 1910                    | 1784                     | 501         |
| 61      | Lower meeting rooms           | 1130         | 26              | 1243         | 6.1        | 3.4              | 3.2               | 1859                    | 1726                     | 257         |
| 62      | Waiting area                  | 1528         | 18              | 1681         | 1.0        | 2.3              | 1.9               | 1224                    | 1026                     | 236         |
| 63      | Upper Offices                 | 1873         | 48              | 2060         | 10.0       | 5.1              | 4.7               | 3194                    | 2936                     | 458         |
|         | <b>Sub Total</b>              | <b>5619</b>  | <b>156</b>      | <b>6181</b>  | <b>20</b>  | <b>15</b>        | <b>14</b>         | <b>8187</b>             | <b>7472</b>              | <b>1452</b> |
|         | <b>4th F</b>                  |              |                 |              |            |                  |                   |                         |                          |             |
| 64      | Lower Offices                 | 2508         | 53              | 2759         | 13.4       | 8.8              | 7.8               | 4984                    | 4338                     | 540         |
| 65      | Upper Offices                 | 2508         | 60              | 2759         | 13.4       | 9.1              | 8.0               | 5037                    | 4391                     | 586         |
|         | <b>Sub Total</b>              | <b>5016</b>  | <b>113</b>      | <b>5518</b>  | <b>27</b>  | <b>17.9</b>      | <b>15.9</b>       | <b>10021</b>            | <b>8729</b>              | <b>1126</b> |
|         |                               | <b>25242</b> | <b>691</b>      | <b>27766</b> | <b>98</b>  | <b>76.5</b>      | <b>69.0</b>       | <b>40127</b>            | <b>35568</b>             | <b>6460</b> |
|         | <b>TFA-1</b>                  |              |                 |              |            | <b>27.5</b>      | <b>24.7</b>       |                         |                          | <b>3945</b> |
|         | <b>TFA-2</b>                  |              |                 |              |            | <b>17.5</b>      | <b>15.8</b>       |                         |                          | <b>2515</b> |
|         | <b>Total</b>                  |              |                 |              |            | <b>121.5</b>     | <b>109.5</b>      |                         |                          |             |
|         | <b>Auditorium</b>             |              |                 |              |            |                  |                   |                         |                          |             |
|         | <b>GF</b>                     |              |                 |              |            |                  |                   |                         |                          |             |
| 66      | Examination Hall Right        | 2142         | 111             | 2356         | 2.9        | 7.3              | 6.7               | 3372                    | 2990                     | 1249        |
| 67      | Examination Hall Left         | 2142         | 111             | 2356         | 2.9        | 7.4              | 6.8               | 3410                    | 3035                     | 1249        |
| 70      | Auditorium                    | 10463        | 664             | 11509        | 7.0        | 30.2             | 26.4              | 17313                   | 15142                    | 5132        |
| 68      | Exam Hall Entrance lobby      | 484          | 16              | 533          | 0.3        | 3.2              | 2.2               | 1839                    | 1231                     | 195         |
| 69      | Main Entrance lobby           | 1539         | 51              | 1693         | 1.0        | 10.3             | 7.3               | 5405                    | 3659                     | 620         |
| 71      | Auditorium Corridor           | 5543         | 158             | 6098         | 3.7        | 12.8             | 11.3              | 5706                    | 4835                     | 432         |
| 72      | Office room                   | 140          | 3               | 154          | 0.8        | 0.8              | 0.6               | 412                     | 311                      | 30          |
| 73      | VIP Room                      | 129          | 4               | 142          | 0.3        | 0.7              | 0.5               | 378                     | 272                      | 36          |
| 74      | Green room Male               | 91           | 4               | 101          | 0.1        | 0.6              | 0.4               | 317                     | 214                      | 46          |
| 75      | Green room Female             | 140          | 6               | 154          | 0.1        | 0.8              | 0.6               | 416                     | 289                      | 69          |
|         | <b>Sub Total</b>              | <b>22814</b> | <b>1129</b>     | <b>25096</b> | <b>19</b>  | <b>74</b>        | <b>63</b>         | <b>38568</b>            | <b>31977</b>             | <b>9061</b> |
|         | <b>FF</b>                     |              |                 |              |            |                  |                   |                         |                          |             |
| 76      | Corridor (Single              | 3305         | 94              | 3635         | 2.2        | 8.2              | 7.0               | 3723                    | 3069                     | 258         |

| SI. No. | DESCRIPTION                       | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air    |
|---------|-----------------------------------|--------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|--------------|
|         |                                   | SQFT         | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM          |
|         | Height)                           |              |                 |              |            |                  |                   |                         |                          |              |
| 77      | Corridor Left (Multi Height)      | 1023         | 29              | 1125         | 0.7        | 3.2              | 2.5               | 1562                    | 1149                     | 80           |
| 78      | Corridor Right(Multi Height)      | 1023         | 29              | 1125         | 0.7        | 3.5              | 2.8               | 1699                    | 1286                     | 80           |
|         | <b>Sub Total</b>                  | <b>5350</b>  | <b>153</b>      | <b>5885</b>  | <b>3.6</b> | <b>14.9</b>      | <b>12.3</b>       | <b>6984</b>             | <b>5504</b>              | <b>417</b>   |
|         | <b>SF</b>                         |              |                 |              |            |                  |                   |                         |                          |              |
| 79      | Corridor ( Single Height )        | 1749         | 50              | 1924         | 1.2        | 5.0              | 4.1               | 2333                    | 1837                     | 136          |
| 80      | Corridor Left ( Multi Height )    | 780          | 22              | 858          | 0.5        | 1.9              | 1.7               | 845                     | 721                      | 61           |
| 81      | Corridor Right ( Multi Height )   | 780          | 22              | 858          | 0.5        | 1.7              | 1.5               | 769                     | 645                      | 61           |
|         | <b>Sub Total</b>                  | <b>3310</b>  | <b>95</b>       | <b>3641</b>  | <b>2.2</b> | <b>8.6</b>       | <b>7.3</b>        | <b>3947</b>             | <b>3203</b>              | <b>258</b>   |
|         | <b>3rd F</b>                      |              |                 |              |            |                  |                   |                         |                          |              |
| 82      | Sound & light Room                | 183          | 2               | 201          | 1.0        | 1.2              | 0.9               | 670                     | 473                      | 27           |
| 83      | Pre Function area (Double Height) | 1658         | 55              | 1823         | 2.2        | 8.6              | 6.5               | 4395                    | 3184                     | 668          |
| 84      | Pre Function area (Single Height) | 1378         | 46              | 1516         | 1.8        | 5.6              | 4.4               | 2750                    | 2065                     | 555          |
|         | <b>Sub Total</b>                  | <b>3218</b>  | <b>103</b>      | <b>3540</b>  | <b>5</b>   | <b>15.5</b>      | <b>12</b>         | <b>7814</b>             | <b>5722</b>              | <b>1251</b>  |
|         | <b>4th F</b>                      |              |                 |              |            |                  |                   |                         |                          |              |
| 85      | Corridor                          | 1378         | 46              | 1516         | 1.8        | 6.0              | 4.7               | 2950                    | 2201                     | 107          |
|         | <b>Sub Total</b>                  | <b>1378</b>  | <b>46</b>       | <b>1516</b>  | <b>2</b>   | <b>6.0</b>       | <b>4.7</b>        | <b>2950</b>             | <b>2201</b>              | <b>107</b>   |
|         |                                   | <b>36070</b> | <b>1525</b>     | <b>39677</b> | <b>32</b>  | <b>119.1</b>     | <b>99.0</b>       | <b>60264</b>            | <b>48607</b>             | <b>11094</b> |
|         | <b>TFA-1</b>                      |              |                 |              |            | <b>38.3</b>      | <b>34.4</b>       |                         |                          | <b>5493</b>  |
|         | <b>TFA-2</b>                      |              |                 |              |            | <b>39.1</b>      | <b>35.1</b>       |                         |                          | <b>5600</b>  |
|         | <b>Total</b>                      |              |                 |              |            | <b>196.5</b>     | <b>168.6</b>      |                         |                          |              |
|         | <b>Nursing College</b>            |              |                 |              |            |                  |                   |                         |                          |              |
|         | <b>GF</b>                         |              |                 |              |            |                  |                   |                         |                          |              |
| 86      | Nursing Library                   | 2583         | 96              | 2842         | 5.2        | 6.5              | 6.3               | 3000                    | 2889                     | 1138         |
| 87      | Conference rooms Left             | 549          | 18              | 604          | 1.1        | 1.5              | 1.4               | 753                     | 660                      | 160          |
| 88      | Conference rooms Right            | 549          | 18              | 604          | 1.1        | 1.5              | 1.4               | 753                     | 660                      | 160          |
| 89      | Waiting Area                      | 1184         | 39              | 1302         | 1.6        | 3.0              | 2.8               | 1330                    | 1175                     | 349          |
|         | <b>Sub Total</b>                  | <b>4865</b>  | <b>171</b>      | <b>5352</b>  | <b>9</b>   | <b>13</b>        | <b>12</b>         | <b>5836</b>             | <b>5384</b>              | <b>1806</b>  |
|         | <b>FF</b>                         |              |                 |              |            |                  |                   |                         |                          |              |
| 90      | Faculty Lounge                    | 3283         | 66              | 3611         | 8.8        | 5.4              | 5.1               | 3081                    | 2932                     | 900          |
| 91      | Offices                           | 2508         | 50              | 2759         | 13.4       | 7.9              | 7.1               | 4008                    | 3568                     | 521          |

| Sl. No. | DESCRIPTION             | AREA          | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air    |
|---------|-------------------------|---------------|-----------------|--------------|------------|------------------|-------------------|-------------------------|--------------------------|--------------|
|         |                         | SQFT          | Nos.            | WATT         | HP         | TR               | TR                | CFM                     | CFM                      | CFM          |
|         | <b>Sub Total</b>        | <b>5791</b>   | <b>116</b>      | <b>6370</b>  | <b>22</b>  | <b>13</b>        | <b>12</b>         | <b>7088</b>             | <b>6500</b>              | <b>1420</b>  |
|         | <b>2nd F</b>            |               |                 |              |            |                  |                   |                         |                          |              |
| 92      | Seminar & Learning area | 3283          | 62              | 3611         | 17.6       | 9.2              | 8.7               | 4617                    | 4356                     | 659          |
| 93      | Nursing Classroom       | 2508          | 154             | 2759         | 3.4        | 9.4              | 8.9               | 3824                    | 3496                     | 1697         |
|         | <b>Sub Total</b>        | <b>5791</b>   | <b>216</b>      | <b>6370</b>  | <b>21</b>  | <b>18.6</b>      | <b>17.6</b>       | <b>8441</b>             | <b>7852</b>              | <b>2356</b>  |
|         |                         | <b>16447</b>  | <b>503</b>      | <b>18092</b> | <b>52</b>  | <b>44.4</b>      | <b>41.6</b>       | <b>21364</b>            | <b>19736</b>             | <b>5582</b>  |
|         | <b>TFA-1</b>            |               |                 |              |            | <b>19.5</b>      | <b>17.5</b>       |                         |                          | <b>2791</b>  |
|         | <b>TFA-2</b>            |               |                 |              |            | <b>19.5</b>      | <b>17.5</b>       |                         |                          | <b>2791</b>  |
|         | <b>Total</b>            |               |                 |              |            | <b>83.3</b>      | <b>76.6</b>       |                         |                          |              |
|         | <b>Grand Total</b>      | <b>197407</b> | <b>5664</b>     |              |            | <b>1140</b>      | <b>1016</b>       | <b>322362</b>           | <b>279647</b>            | <b>26756</b> |

## HEAT LOAD SUMMARY – AYUSH BLOCK

| Sl.No. | DESCRIPTION           | AREA        | TOTAL OCCUPANCY | LIGHT LOAD  | EQPT. LOAD | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air   |
|--------|-----------------------|-------------|-----------------|-------------|------------|------------------|-------------------|-------------------------|--------------------------|-------------|
|        |                       |             | SQFT            | Nos.        | WATT       | HP               | TR                | TR                      | CFM                      | CFM         |
|        | <b>GF</b>             |             |                 |             |            |                  |                   |                         |                          |             |
| 1      | OPD-1                 | 181         | 5               | 199         | 0.7        | 0.9              | 0.8               | 542                     | 457                      | 59          |
| 2      | OPD-2                 | 172         | 5               | 189         | 0.7        | 0.9              | 0.8               | 514                     | 442                      | 56          |
| 3      | OPD-3                 | 172         | 5               | 189         | 0.7        | 0.9              | 0.8               | 490                     | 425                      | 56          |
| 4      | OPD-4                 | 172         | 5               | 189         | 0.7        | 0.9              | 0.8               | 445                     | 386                      | 56          |
| 5      | OPD-5                 | 172         | 5               | 189         | 0.7        | 0.8              | 0.7               | 448                     | 387                      | 56          |
| 6      | OPD-6                 | 181         | 5               | 199         | 0.7        | 0.9              | 0.8               | 478                     | 408                      | 59          |
| 14     | Conference room       | 215         | 8               | 237         | 1.2        | 1.4              | 1.0               | 832                     | 623                      | 71          |
| 15     | Vitals                | 194         | 4               | 213         | 0.8        | 0.9              | 0.7               | 526                     | 394                      | 64          |
| 16     | Meds                  | 86          | 2               | 95          | 0.1        | 0.3              | 0.2               | 177                     | 124                      | 28          |
| 17     | Office                | 118         | 3               | 130         | 0.6        | 0.5              | 0.4               | 266                     | 221                      | 39          |
| 18     | Register & Bill       | 118         | 2               | 130         | 0.6        | 0.7              | 0.5               | 424                     | 309                      | 39          |
| 7      | Procedure room        | 291         | 4               | 320         | 0.6        | 1.1              | 0.9               | 618                     | 456                      | 95          |
| 8      | Operation room        | 355         | 5               | 391         | 10.7       | 3.4              | 3.2               | 1907                    | 1797                     | 117         |
| 9      | Equipment room        | 158         | 1               | 174         | 0.2        | 0.6              | 0.4               | 361                     | 263                      | 52          |
| 10     | Nour                  | 104         | 4               | 115         | 0.2        | 0.4              | 0.3               | 199                     | 160                      | 34          |
| 11     | Meds                  | 108         | 2               | 118         | 0.1        | 0.5              | 0.4               | 311                     | 231                      | 35          |
| 12     | Lab                   | 269         | 4               | 296         | 1.4        | 1.3              | 1.0               | 775                     | 608                      | 88          |
| 13     | Store room            | 366         | 1               | 403         | 0.0        | 1.0              | 0.7               | 649                     | 417                      | 120         |
| 19     | Medicine storage      | 374         | 1               | 411         | 0.5        | 1.0              | 0.9               | 611                     | 529                      | 123         |
| 22     | Pharmacy              | 351         | 10              | 386         | 0.7        | 0.9              | 0.8               | 460                     | 399                      | 115         |
| 20     | Manager               | 161         | 5               | 178         | 0.9        | 0.5              | 0.5               | 231                     | 224                      | 53          |
| 21     | Admin                 | 334         | 4               | 367         | 1.8        | 1.5              | 1.3               | 899                     | 795                      | 109         |
| 23     | Material storage      | 344         | 1               | 379         | 0.5        | 0.6              | 0.4               | 342                     | 262                      | 113         |
| 24     | Staff locker & lounge | 280         | 8               | 308         | 0.4        | 1.4              | 1.0               | 798                     | 564                      | 92          |
| 25     | Changing room         | 140         | 4               | 154         | 0.2        | 0.7              | 0.5               | 397                     | 279                      | 46          |
| 26     | Hydrotherapy          | 183         | 2               | 201         | 0.5        | 0.8              | 0.6               | 460                     | 328                      | 60          |
| 27     | Panchkarma            | 1259        | 25              | 1385        | 2.5        | 3.1              | 2.7               | 1692                    | 1416                     | 413         |
| 28     | Youga                 | 840         | 14              | 924         | 1.7        | 1.9              | 1.7               | 1045                    | 885                      | 275         |
| 29     | Meditation            | 549         | 9               | 604         | 1.1        | 1.8              | 1.4               | 1046                    | 789                      | 180         |
|        | <b>Sub Total</b>      | <b>8248</b> | <b>153</b>      | <b>9073</b> | <b>32</b>  | <b>31.6</b>      | <b>26.2</b>       | <b>17944</b>            | <b>14578</b>             | <b>2705</b> |
|        | <b>TFA</b>            |             |                 |             |            | <b>18.9</b>      | <b>17.0</b>       |                         |                          | <b>2705</b> |
|        |                       |             |                 |             |            | <b>50.5</b>      | <b>43.2</b>       |                         |                          |             |
|        | <b>FF</b>             |             |                 |             |            |                  |                   |                         |                          |             |

| SI.No. | DESCRIPTION           | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EQPT. LOAD  | SUMMER REF. LOAD | MONSOON REF. LOAD | Summer Dehumidified CFM | Monsoon Dehumidified CFM | Fresh Air   |
|--------|-----------------------|--------------|-----------------|--------------|-------------|------------------|-------------------|-------------------------|--------------------------|-------------|
|        |                       | SQFT         | Nos.            | WATT         | HP          | TR               | TR                | CFM                     | CFM                      | CFM         |
| 1      | 2 Bed Private room-1  | 323          | 4               | 355          | 0.6         | 1.2              | 0.9               | 694                     | 550                      | 106         |
| 2      | 2 Bed Private room-2  | 323          | 4               | 355          | 0.6         | 1.1              | 0.9               | 660                     | 538                      | 106         |
| 3      | 2 Bed Private room-3  | 344          | 4               | 379          | 0.7         | 1.1              | 0.9               | 674                     | 551                      | 113         |
| 4      | 2 Bed Private room-4  | 355          | 4               | 391          | 0.7         | 1.6              | 1.2               | 904                     | 671                      | 117         |
| 14     | 2 Bed Private room-5  | 355          | 4               | 391          | 0.7         | 0.9              | 0.8               | 550                     | 483                      | 117         |
| 15     | 2 Bed Private room-6  | 355          | 4               | 391          | 0.7         | 1.0              | 0.9               | 604                     | 513                      | 117         |
| 5      | 4 Beds Ward-1         | 549          | 8               | 604          | 1.1         | 1.5              | 1.3               | 783                     | 651                      | 180         |
| 6      | 4 Beds Ward-2         | 527          | 8               | 580          | 1.1         | 1.4              | 1.2               | 740                     | 623                      | 173         |
| 16     | 4 Beds Ward-3         | 549          | 8               | 604          | 1.1         | 1.2              | 1.1               | 689                     | 581                      | 180         |
| 17     | 4 Beds Ward-4         | 527          | 8               | 580          | 1.1         | 1.1              | 0.9               | 642                     | 550                      | 173         |
| 7      | 1 Bed Private room-1  | 355          | 2               | 391          | 0.5         | 1.1              | 0.8               | 608                     | 440                      | 117         |
| 18     | 1 Bed Private room -2 | 355          | 2               | 391          | 0.7         | 0.9              | 0.7               | 542                     | 411                      | 117         |
| 19     | 1 Bed Private room -3 | 340          | 2               | 374          | 0.7         | 0.8              | 0.6               | 485                     | 373                      | 112         |
| 8      | Nurse station left    | 80           | 2               | 88           | 0.1         | 0.4              | 0.3               | 185                     | 132                      | 26          |
| 9      | Nour left             | 72           | 2               | 79           | 0.1         | 0.4              | 0.3               | 181                     | 131                      | 24          |
| 10     | Nurse station Right   | 81           | 2               | 89           | 0.1         | 0.4              | 0.3               | 183                     | 131                      | 26          |
| 11     | Nour Right            | 72           | 2               | 79           | 0.1         | 0.4              | 0.3               | 181                     | 131                      | 24          |
| 12     | Lobby                 | 3767         | 63              | 4144         | 2.5         | 17.0             | 12.5              | 9130                    | 6537                     | 1236        |
| 13     | Equipment Store       | 301          | 1               | 332          | 0.4         | 1.0              | 0.8               | 596                     | 465                      | 99          |
|        | <b>Total</b>          | <b>9633</b>  | <b>134</b>      | <b>10596</b> | <b>13.8</b> | <b>34.5</b>      | <b>26.7</b>       | <b>19030</b>            | <b>14463</b>             | <b>3160</b> |
|        | <b>TFA</b>            |              |                 |              |             | <b>22.0</b>      | <b>19.8</b>       |                         |                          | <b>3160</b> |
|        |                       |              |                 |              |             | <b>56.5</b>      | <b>46.5</b>       |                         |                          |             |
|        | <b>Grand Total</b>    | <b>17881</b> | <b>287</b>      | <b>19669</b> | <b>45</b>   | <b>107.0</b>     | <b>89.7</b>       | <b>36974</b>            | <b>29041</b>             | <b>5865</b> |

## SPACE HEATING LOAD SUMMARY – IPD BLOCK

| S.No. | DESCRIPTION                     | AREA         | TOTAL OCCUPANCY | LIGHT LOAD   | EOPT. LOAD as per med. Eq. | EOPT. LOAD (diversified) | WINTER REF. LOAD | Fresh Air   |
|-------|---------------------------------|--------------|-----------------|--------------|----------------------------|--------------------------|------------------|-------------|
|       |                                 | SQFT         | Nos.            | WATT         | KW                         | HP                       | KW               | CFM         |
|       | <b>LEVEL 0</b>                  |              |                 |              |                            |                          |                  |             |
| 4     | Dialysis                        | 13778        | 85              | 15156        |                            | 27.7                     | -12.8            | 4520        |
| 9     | Casualty Beds                   | 13046        | 190             | 14351        |                            | 26.2                     | -5.4             | 4280        |
|       | <b>Total</b>                    | <b>26824</b> | <b>275</b>      | <b>29506</b> |                            | <b>54</b>                | <b>-18.3</b>     | <b>8800</b> |
|       | <b>LEVEL 1</b>                  |              |                 |              |                            |                          |                  |             |
| 8     | ICU S.S                         | 15177        | 110             | 16695        |                            | 61.0                     | -17.7            | 4978        |
| 9     | Casualty Beds & Invasive cardio | 13304        | 110             | 14635        |                            | 26.8                     | -13.2            | 4367        |
| 10    | Casualty Bed With Medication    | 13304        | 120             | 14635        |                            | 26.8                     | -10.2            | 4367        |
| 11    | Casualty Beds Lower             | 13304        | 110             | 14635        |                            | 26.8                     | -13.4            | 4367        |
| 12    | Gen. ICU Beds                   | 15285        | 110             | 16813        |                            | 61.5                     | -16.7            | 5013        |
| 14    | Anesthesia                      | 11948        | 200             | 13143        |                            | 16.0                     | -12.0            | 3918        |
| 19    | VASC & EP LAB                   | 1905         | 16              | 2096         |                            | 7.7                      | -8.3             | 1875        |
| 20    | SP.OT 1                         | 775          | 8               | 1000         | 10                         | 13.4                     | -1.2             | 1093        |
| 21    | SP.OT 2                         | 775          | 8               | 1000         | 10                         | 13.4                     | -1.2             | 1093        |
| 22    | SP.OT 3                         | 775          | 8               | 1000         | 10                         | 13.4                     | -1.0             | 1093        |
| 23    | SP.OT 4                         | 775          | 8               | 1000         | 10                         | 13.4                     | -1.0             | 1093        |
| 24    | SP.OT 5 ( Burns OT assumed )    | 775          | 8               | 1000         | 10                         | 13.4                     | -1.0             | 1093        |
| 25    | SP.OT 6                         | 840          | 8               | 1000         | 10                         | 13.4                     | -20.7            | 3948        |
| 26    | MJ.OT 1 ( Burns OT assumed )    | 646          | 8               | 1000         | 10                         | 13.4                     | -0.2             | 911         |
| 27    | MJ.OT 2                         | 646          | 8               | 1000         | 10                         | 13.4                     | -0.2             | 911         |
| 28    | MJ.OT 3                         | 646          | 8               | 1000         | 10                         | 13.4                     | -0.2             | 911         |
| 29    | MJ.OT 4                         | 646          | 8               | 1000         | 10                         | 13.4                     | -0.2             | 911         |
| 30    | MJ.OT 5                         | 710          | 8               | 1000         | 10                         | 13.4                     | -0.4             | 1002        |
| 31    | MJ.OT 6                         | 710          | 8               | 1000         | 10                         | 13.4                     | -0.4             | 1002        |
| 32    | MJ.OT 7                         | 710          | 8               | 1000         | 10                         | 13.4                     | -0.4             | 1002        |
| 33    | MJ.OT 8                         | 775          | 8               | 1000         | 10                         | 13.4                     | -18.6            | 3644        |
| 34    | MJ.OT 9                         | 646          | 8               | 1000         | 10                         | 13.4                     | 0.3              | 911         |
| 35    | MJ.OT 10                        | 646          | 8               | 1000         | 10                         | 13.4                     | 0.3              | 911         |
| 36    | MJ.OT 11                        | 646          | 8               | 1000         | 10                         | 13.4                     | 0.3              | 911         |
| 37    | MJ.OT 12                        | 646          | 8               | 1000         | 10                         | 13.4                     | 0.3              | 911         |
| 38    | MJ.OT 13                        | 710          | 8               | 1000         | 10                         | 13.4                     | -0.4             | 1002        |
| 39    | MJ.OT 14                        | 710          | 8               | 1000         | 10                         | 13.4                     | -0.4             | 1002        |



| S.No. | DESCRIPTION             | AREA          | TOTAL OCCUPANCY | LIGHT LOAD    | EQPT. LOAD as per med. Eq. | EQPT. LOAD (diversified) | WINTER REF. LOAD | Fresh Air     |
|-------|-------------------------|---------------|-----------------|---------------|----------------------------|--------------------------|------------------|---------------|
|       |                         | SQFT          | Nos.            | WATT          | KW                         | HP                       | KW               | CFM           |
| 40    | MJ.OT 15                | 710           | 8               | 1000          | 10                         | 13.4                     | -0.4             | 1002          |
| 41    | MJ.OT 16                | 775           | 8               | 1000          | 10                         | 13.4                     | -1.0             | 1093          |
| 42    | Sterile Core 1          | 1227          | 2               | 1350          |                            | 3.3                      | -10.8            | 1730          |
| 43    | Sterile Core 2          | 1722          | 2               | 1894          |                            | 4.6                      | -14.0            | 2430          |
| 44    | Sterile Core 3          | 1722          | 2               | 1894          |                            | 4.6                      | -14.0            | 2430          |
| 45    | Sterile Core 4          | 1518          | 2               | 1669          |                            | 4.1                      | -12.3            | 2140          |
| 46    | OT Corridor-1           | 1851          | 5               | 2037          |                            | 5.0                      | -9.5             | 1822          |
| 47    | OT, Corridor-2          | 1851          | 5               | 2037          |                            | 5.0                      | -9.5             | 1822          |
| 48    | OT, Corridor-3          | 1765          | 5               | 1942          |                            | 4.7                      | -9.1             | 1740          |
| 49    | Endoscopy               | 926           | 9               | 1018          |                            | 1.9                      | -5.7             | 911           |
|       | <b>Total</b>            | <b>112505</b> | <b>984</b>      | <b>128493</b> |                            | <b>554</b>               | <b>-224</b>      | <b>71360</b>  |
|       | <b>LEVEL 3</b>          |               |                 |               |                            |                          |                  |               |
| 1     | S.S & GEN PEDS ( BEDS ) | 21646         | 174             | 23811         |                            | 43.5                     | -44.2            | 7100          |
| 2     | NICU                    | 13003         | 110             | 14303         |                            | 26.1                     | -31.2            | 4860          |
| 4     | Birthing Centre         | 13390         | 110             | 14729         | 130                        | 87.1                     | -0.1             | 4392          |
| 7     | S.S & GEN BEDS          | 13003         | 110             | 14303         |                            | 26.1                     | -30.8            | 4675          |
| 8     | GYN & OB BEDS           | 21646         | 130             | 23811         |                            | 43.5                     | -43.4            | 7100          |
|       | <b>Total</b>            | <b>82689</b>  | <b>634</b>      | <b>90958</b>  |                            | <b>226</b>               | <b>-150</b>      | <b>28127</b>  |
|       | <b>LEVEL 4</b>          |               |                 |               |                            |                          |                  |               |
| 1     | GEN BEDS LOWER          | 21646         | 190             | 23811         |                            | 43.5                     | -23.5            | 7100          |
| 2     | S.S BEDS LOWER          | 13003         | 110             | 14303         |                            | 26.1                     | -19.6            | 4675          |
| 4     | GEN BEDS                | 14574         | 145             | 16032         |                            | 29.3                     | -14.2            | 4600          |
| 6     | S.S BEDS UPPER          | 13003         | 110             | 14303         |                            | 26.1                     | -19.6            | 4675          |
| 7     | GEN BEDS UPPER          | 21646         | 190             | 23811         |                            | 43.5                     | -23.5            | 7100          |
|       | <b>Total</b>            | <b>83873</b>  | <b>745</b>      | <b>92260</b>  |                            | <b>169</b>               | <b>-100</b>      | <b>28150</b>  |
|       | <b>LEVEL 5</b>          |               |                 |               |                            |                          |                  |               |
| 1     | GEN BEDS LOWER          | 21646         | 190             | 23811         |                            | 43.5                     | -25.3            | 6750          |
| 2     | S.S BEDS LOWER          | 13003         | 100             | 14303         |                            | 26.1                     | -16.9            | 4340          |
| 4     | ICU                     | 14574         | 45              | 16032         |                            | 29.3                     | -7.4             | 3180          |
| 6     | S.S BED UPPER           | 13003         | 100             | 14303         |                            | 26.1                     | -16.9            | 4340          |
| 7     | GEN BED UPPER           | 21646         | 166             | 23811         |                            | 43.5                     | -26.3            | 6750          |
|       | <b>Total</b>            | <b>83873</b>  | <b>601</b>      | <b>92260</b>  |                            | <b>169</b>               | <b>-93</b>       | <b>25360</b>  |
|       | <b>LEVEL 6</b>          |               |                 |               |                            |                          |                  |               |
| 1     | S.S BED LOWER           | 13003         | 110             | 14303         |                            | 26.1                     | -22.2            | 4675          |
| 3     | ICU                     | 9322          | 45              | 10254         |                            | 18.7                     | -16.1            | 3180          |
| 5     | S.S BEDS UPPER          | 13003         | 110             | 14303         |                            | 26                       | -22.1            | 4670          |
|       | <b>Total</b>            | <b>35327</b>  | <b>265</b>      | <b>38860</b>  |                            | <b>71</b>                | <b>-60</b>       | <b>12525</b>  |
|       | <b>Grand Total</b>      | <b>425092</b> | <b>3504</b>     |               | <b>350</b>                 |                          | <b>-646</b>      | <b>174322</b> |

**(Tenderers shall work out the heat loads on their own and satisfy themselves that the plant specified in this tender shall be able to maintain the inside conditions as per specification)**

To cater to the above load, the air conditioning system proposed is as follows:

## **6.0 System Design**

As per the total peak load as above, 4 Nos. working and 01 standby Water cooled centrifugal chillers of 1000 TR and 02 nos. 450 TR centrifugal chillers are proposed. For heating and reheat Heat pumps have been proposed.

### **System Design Description**

- 6.1 It is proposed to provide a central air conditioning system to maintain the specified inside design conditions during summer, monsoon and winter for the proposed building.
- 6.2 Water chilling machines shall work in conjunction with primary chilled water pumps, secondary chilled water pumps. The AC plants shall be located in the separate building near ESS.
- 6.3 Chilled water produced shall be pumped to various air handling units/ Fan coil units. Chilled water shall be pumped through insulated chilled water pipes installed in ceiling spaces and in vertical risers in pipe shafts. At each air handling units balancing valves are provided for balancing.
- 6.4 Heat pumps shall be used for winter heating. This is after taking partial credit for the high equipment load inside and the diversity applicable.
- 6.5 The main electrical panel, distribution board & chilled water/ condenser water pumps will be located in the respective plant rooms.
- 6.6 All the AHU's / FCUs on respective floors shall be connected with chilled/hot water pipes coming from the water chilling machines.
- 6.7 For fire safety motorised fire dampers with electrical actuators interlocked with the air blowers shall be provided in supply and return air paths. All materials used for insulation shall be fire proof type. The air handling unit's motors shall also be interlocked with the central fire alarm system such that in case of detection of smoke or fire by the fire alarm system, the air handling units shall automatically shut off.
- 6.8 A Chiller plant manager shall be provided in AC plant room. CPM shall be connected to Building Management System.
- 6.9 The main areas of the complex are as under:

- A** OTs
- B** ICUs
- C** OPD/CONSULTANTS
- D** PRE & POST OPERATIVE AREAS
- E** ADMINISTRATION AREAS
- F** PATIENT ROOMS / WARDS etc.

The system adopted for the air-conditioning of OTs shall be as following:

**OPERATION THEATRES**

- All operation theatres shall have independent air handling unit to prevent cross contamination.
- All OT's shall be designed for re-circulatory system with 5 air changes fresh air except OTs which are on 100% fresh air. .
- The laminar flow air distribution system shall be followed. Air shall be supplied from ceiling level to flow unidirectionally upto the operation table. The return air shall be collected from four corners of the room to prevent the contamination from re-circulation in space.
- All ducting for OTs shall be of aluminium because GI duct can cause formation of flakes on contacting moisture that can be carried downstream.
- Both supply and return air shall be ducted.
- Three level filtration shall be adopted with pre-filters, fine filters and HEPA filters of following filtration efficiency :

HEPA Filters                    99.97% down to 0.3 μ (MERV-17)

Fine Filters                    99% down to 3 μ (MERV-14)

Pre Filters                    90% down to 10 μ (MERV-7)

All these filters shall be with aluminium frame to prevent formation of bacterial colonies. Epoxy resin shall be used to seal filter media with the framework.

OTs shall be maintained at positive pressure by supplying about 15% more air than return air to prevent any contamination from entering OT space.

- AHUs with HEPA filters shall be designed for high static pressure to overcome high pressure drops

**PRE/POST OPERATIVE AREAS/ STERILE CORRIDOR/PATIENT WARDS**

- AHUs for pre post operative areas shall be provided with pre and fine filters.

## 7. GENERAL DESIGN GUIDELINES

Design parameters for selection of air handling units and its components shall be: -

|   |           |
|---|-----------|
| Maximum face velocity across prefilters   | 150M/MIN  |
| Maximum face velocity across Microvee     | 150M/MIN  |
| Maximum face velocity across cooling coil | 150 M/MIN |
| Maximum face velocity across Heating coil | 200 M/MIN |
| Maximum fan outlet velocity               | 550 M/MIN |
| Maximum fan motor speed                   | 1450 RPM  |

CHW piping shall be sized for following design parameters

|   |             |
|---|-------------|
| Maximum flow velocity   | 2.5 M/SEC   |
| Design parameters for duct design shall be<br>Maximum flow velocity | 450M/MIN    |
| Maximum friction  | 1CM WG/100M |
| Maximum velocity at supply air outlet                               | 150 M/MIN   |

### 8.0 Items to be provided by other Agencies to AC contractor:

- 8.1 Construction of AC plant rooms, AHU rooms etc.
- 8.2 Main 3 ph, 415 v, 50 hz, A.C. supply power supply up to main Electrical Distribution Panel in A/C plant room.
- 8.3 Soft filtered water supply up to each cooling tower and expansion tank etc.
- 8.4 Make up water tanks for soft water.
- 8.5 Drain trap in plant room and AHU rooms.
- 8.6 Any kind of false ceiling, boxing etc and insulation of boxing in non AC areas.
- 8.7 Making frames for fixing grilles & diffusers in false ceiling, boxing or in walls.

### 9.0 Drawings:

The drawings forming part of these specifications provide a feasible scheme for locating the equipment. The contractor may re-arrange the equipment for improving the layout and meeting the site conditions. All such changes shall however be subject to the architect's approval. These drawings are not meant to be

working drawings which shall be prepared by the contractor.

Drawings for approval on award of the work:-

The contractor shall prepare & submit three sets of hard copy & one Digital/soft copy in AutoCAD format of following drawings and get them approved from the engineer-in-Charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipments/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

- i) Lay out drawings of the equipments to be installed in various rooms such as plant room, AHU rooms, hot water generator room, cooling tower and other equipments.
- ii) Drawings including section, showing the details of erection of entire equipments including their foundations, water basin for the cooling towers / air washers, etc.
- iii) Plumbing drawings showing the layout of entire piping, dia & length of pipes, valves and isometric drawings showing connections to various equipment.
- iv) Ducting drawings showing sizes, locations of dampers, grilles & diffusers.
- v) Electrical wiring diagrams for all electrical equipments and controls including the sizes and capacities of the various cables and equipments.
- vi) Dimensioned drawings of all electrical and control panels.
- vii) Drawings showing the details of all insulations and vapour barrier works.
- viii) Drawings showing details of supports for pipes, cable trays, ducts etc.
- ix) Any other drawings relevant to the work.

The department shall, at its discretion, use the soft copy of such drawings to prepare and examine the integrated services layout, resolve conflicts, and advise the contractor to modify the execution drawings suiting & adjusting to all the services requirements. The contractor shall be bound to modify & execute accordingly.

#### **10.0 Completion drawings (As Built Drawings)**

One set of Digital/ soft Copy and one set of the following laminated drawings shall be submitted by the contractor while handing over the installation to the client. Out of this one of the sets shall be laminated on a hard base for display in the A.C. plant room. In addition one set will be given on compact disc.

- (i) Plant installation drawings giving complete details of all the equipments, including their foundations.
- (ii) AHU room installation drawings.

(iii) Plumbing layout drawings including insulation giving sizes and lengths of all the pipes and the sizes and locations of all types of valves, and including isometric drawings for the entire piping including the pipe connections to the various equipments and insulation details wherever required.

(iv) Duct layout drawings with their sizes and locations, and sizes and locations of all dampers, grills & diffusers.

(v) Line diagram and layout of all electrical control panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

(vi) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.

(vii) BMS drawings (wherever applicable)

### **11.0 Test Data:**

The complete HVAC system shall be tested as per the specifications given elsewhere and complete test data shall be furnished on prescribed data sheets:

### **12.0 Documents to be furnished on completion of installation**

Three sets of the following documents shall be furnished to the department by the contractor on completion of work:-

a) Completion drawings as per 10.0.

b) One set in Digital form and 1 set in printed form of manufacturer's technical catalogues of all equipments and accessories,

c) Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

### **13.0 Technical Data:**

The contractor shall furnish complete technical data, on the equipment offered as required under the heading 'Technical data'. In this specification every effort has been taken to put forth only general specifications of various equipments/ material. If inadvertently, any of the specification drawn happens to match with the specifications of any one particular firm's product only, in respect of critical parameters, than it will not automatically mean that this particular firm's offer is only technically suitable. In general, the specifications offered by other firms will be assessed in their own entirety to ascertain whether or not the broad functions in general expected of the requirements are available with reasonable tolerance on the desired requirements of the client and accordingly the offers would be considered based on prudent assessment and sole discretion of the Engineer.

### **14.0 Performance Guarantee:**

- 14.1 The contractor shall guarantee that the air-conditioning plant and system shall maintain the desired inside temperature within +/- 2 % tolerance.
- 14.2 The contractor shall guarantee that the capacity of various components as well as the whole system shall not be less than specified.
- 14.3 The contractor shall ensure that the system shall be free of vibrations and disturbing sounds.

#### **15.0 Foreign Exchange**

The contractor shall make his own arrangements to procure the necessary, specified equipments, controls for which no foreign exchange shall be made available.

## **CENTRAL AIR CONDITIONING PLANT**

### **1.0 SCOPE**

This chapter describes central Air-conditioning plant with factory assembled & tested chilling units (ARI certified) comprising of Centrifugal / Screw compressor, as the case may be, direct driven with electric motor, water cooled condenser, chiller, micro computer control centre and all interconnecting unit piping and wiring and tested and complete in all respects and shall generally comply with specifications as given in subsequent paragraphs. Control panel box with controls, starter for motor as specified and MODBUS/ BACNET connectivity.

Performance will be certified in accordance with ARI Standard 550/590 (latest) and ECBC 2017. Only chillers that are listed in the ARI Certification Program are acceptable.

AHRI certified selection sheets should mention VFD with active harmonic filter and sound level at 100%, 75%, 50% and 25% load as per AHRI standard and sound level at part load should not exceed full load.

### **1.1 CENTRIFUGAL COMPRESSORS**

#### **1.1.1 Type**

Centrifugal compressor shall be open/ semi-sealed/ totally sealed type. It shall be working on refrigerant 134a. The impeller shall be of shrouded design and made of cast aluminium alloy of high strength and protected against corrosion. This shall be statically and dynamically balanced and over speed tested so as to ensure vibration free operation. The impeller shaft or drive end of the gear shaft, as the case may be, shall be connected with the motor through a flexible coupling in case of open design and rotor shaft in case of hermetic design. The compressor casing shall be of high strength ductile casting and of such design that servicing can be carried out without disturbing connections.

#### **1.1.2 Drive gear**

Where the impeller is designed for operation at speed higher than the drive motor, necessary speed increasing gear shall be connected to the impeller shaft in a self aligning and balanced way. The gears and pinion shall be pressure lubricated.

#### **1.1.3 Bearings:**

The compressor shall incorporate the necessary design features to take both axial and radial thrusts. The bearings shall be of self aligning type. The bearing shall be pressure lubricated during operation and shall be completely sequenced and interlocked with the start up of the machine in such a way that oil pump should start earlier than the machine and the machine should start after some time, provided the required oil temperature and pressure is maintained during the start up period.



#### 1.1.4 Shaft seal:

The compressor shaft seal (in case of open type machines) shall be as per manufacturer's standard design. The seal should have small face area and low rubbing speed. It should provide an efficient seal under both vacuum and pressure lubricated during compressor operation. The seal must effectively prevent the leakage of refrigerant along the shaft during shut down periods. During operation an oil film should prevent outward leakage of refrigerant.

#### 1.1.5 Lubrication system:

Lubrication system must ensure complete forced and speed lubrication (at a pressure and controlled temperature) to all bearing surfaces under any speed conditions, at start up, at shut down and during operation at various loads. Adequate arrangement shall be provided to take care of lubrication during failure of power or abnormal shutdown. Full lubrication must be available to the machine during acceleration and deceleration periods through an automatic auxiliary motor driven pump. The lubrication system should include the following:

- a) Filter mesh size shall be as per manufacturer's standard..
- b) Oil level indicator
- c) Oil coolers and oil heaters (with built-in thermostat to aid maintaining constant temperature)

#### 1.1.6 The compressor shall be complete with all accessories such as drive arrangement (for open drive machines), capacity control and safety controls.

#### 1.1.7 Capacity Control:

a) The compressor shall be equipped for modulating the capacity from 100% up to the 20% for stable operation without surging. The pre rotation vanes located at the impeller inlet for controlling the capacity shall be aerofoil shaped and shall be made as per manufacturer's standard. The vane position shall be controlled through hydraulic / linkage system. The unit shall be designed to unload up to 25% of its rated capacity at Constant Condenser Entering Water Temperature without surging and hot gas bypass.

b) The positioning of the vane shall be through microprocessor-based controller with its sensing elements in the outgoing chilled water lines. The automatic damper will enable maintenance of specified chilled water temperature within  $\pm 0.11$  deg C/0.2 deg F.

#### 1.1.8 Safety Control:

Safety controls shall be provided as per details given under "Controls".

#### 1.1.9 Interlocking

The compressor motor shall be interlocked with the following:

- i) Differential pressure switch in the chilled water line(s) in case of chilled water system, and air flow switch in the evaporator fan discharge in the case of direct expansion system.
- ii) Differential pressure switch in the condenser water line(s) in case of water cooled condenser and air flow switch in the condenser fan discharge in the case of air cooled condenser.
- iii) Anti-freeze thermostat in case of chiller.
- iv) Condenser water pump in case of water cooled condenser and condenser fan in case of air cooled condenser.
- v) Chilled water pump. The interlocks shall be provided with indicating lamps or flags in the control panel in the refrigeration plant room.
- vi) The interlocking of the motor with Differential pressure switch can be done at site.

#### 1.1.10 Drive motor:

- i) The drive motor shall be an independent and coupler type or semi-hermetic / hermetic type depending on the design adopted by the manufacturer. The motor shall be suitable for continuous duty.
- ii) The electric motor shall be of squirrel cage type and shall be suitable for operation on 400/415 V $\pm$ 10%, 3 phase, 50 Hz, Ac supply.
- iii) Synchronous speed of the motor shall not exceed 3000 RPM.
- iv) Continuous BHP rating of the motor shall not be less than the maximum power requirement of the compressor and drive under specified design conditions.
- v) The motor shall be fan cooled for open type chiller unit and refrigerant cooled for hermetic / semi hermetic type chiller unit. Space heaters with necessary controls shall be provided for open type motors.
- vi) Motor protection during over current shall be provided through winding temperature sensor in case of refrigerant cooled motors / current sensing in each phase through microprocessor in case of open type air cooled motors.
- vii) Power factor correction capacitors as required to maintain a displacement power factor of 95% at all load conditions shall be provided.

#### 1.1.11 Motor starter

A variable speed drive will be factory fitted and supplied with the chiller. It will vary the compressor motor speed by controlling the frequency and voltage of the electrical power to the motor. The capacity control logic shall automatically adjust

motor speed and compressor pre-rotation vane position independently for maximum off design efficiency by analyzing information fed to it by sensors located throughout the chiller. Drive will be PWM type utilizing IGBT's with a power factor of 0.95 or better at all loads and speeds. The entire VFD will be UL listed. The following features will be provided:

- a) Door interlocked circuit breaker capable of being padlocked.
- b) UL /EN listed for safety
- c) Ground fault protection.
- d) Over voltage and under voltage protection.
- e) 3-phase sensing motor over current protection.
- f) Single phase protection.
- g) Insensitive to phase rotation.
- h) Over temperature protection.
- i) Digital readout at the chiller unit control panel of output frequency, output voltage, 3-phase output current, input Kilowatts and Kilowatt-hours. Separate meters for this information will not be acceptable.
- j) KW Meter, KWh Meter, Ammeter, Voltmeter & Elapsed Time Meter –Digital readout of all of them must be displayed via the main chiller control panel.

1.1.12 COP shall not be less than 6.5 while IPLV should be greater than 9.25, IKW/TR at design condition shall be 0.64. The chiller shall be ECBC compliant.

## 1.2 SCREW TYPE COMPRESSOR

1.2.1 The screw compressor shall have a rotary mono / twin screw, and may be of open / Semi sealed / totally (hermetic) sealed type. It shall be using refrigerant R-134a.

1.2.2 The mono/ twin rotary screw shall be manufactured from forged steel. The profile of screws shall permit safe operation up to a speed of 5000 RPM for 50 Hz operation. The compressor shall unload from fully loaded to the minimum capacity by means of hydraulically actuated slide valve positioned over the screw rotor/pilot operated solenoid valve.

1.2.3 The compressor housing shall be of high grade cast iron, machined with precision, to provide a very close tolerance between the rotor(s) and the housing.

1.2.4 The rotor(s) shall be mounted on antifriction bearings designed to reduce friction and power input. There shall be multiple cylindrical bearings to handle the radial and axial loads.

1.2.5 There shall be built in oil reservoir to ensure full supply of lubricants to all bearings and a check valve to prevent backspin during shut down.

1.2.6 There shall be oil pump or other means of differential pressure inside the compressor for forced lubrication of all parts during startup, running and during shut down. An oil sump header shall be provided.

1.2.7 The open type compressor shall also have a suitable shaft seal, to prevent leakage of refrigerant.

1.2.8 The units shall be complete with automatic step-less capacity control mechanism to permit modulations between 20% to 100% of capacity range.

1.2.9 Interlocking It shall be as per details given in Para 1.1.9.

1.2.10 The driving motor shall be squirrel cage type hermetic/ Semi hermetic/ Open type as required, protected against damage by means of built in protection devices.

1.2.11 Compressor motor

i) The electrical motor driving the compressor shall be squirrel cage induction motor class 'F' insulation, fan cooled open type unit and totally enclosed (refrigerant cooled) for hermetic/ semi-hermetic unit. The motor shall be suitable continuous duty for operation on  $415 \pm 10\%$  volts, 3 phase, 50 HZ alternating current supply, unless otherwise specified. The motor synchronous speed shall not exceed 3000 r.p.m.

ii) Continuous BHP rating of the motor shall not be less than the maximum power requirement of the compressor and drive under specified design conditions.

1.2.12 Motor starter

The starter shall be mounted on the main electrical control panel / unit mounted/ self mounted as specified. The starter for the motor shall be Star Delta close transition type. Starters shall be rated for intermittent duty. Starting current should not exceed two times the full load current.

The following protective devices will be factory mounted and wired to the starter:

- i. 3-leg sensing electronic overloads with indicating lights and reset button
- ii. Phase rotation protection circuit and indicating light
- iii. Single-phase failure protection circuit and indicating light
- iv. High temperature safety protection system with indicating light and reset button
- v. Hinged access door with lock and
- vi. High and low line voltage protection.

The following convenience items will be factory mounted and wired to the starter:

- a. Auxiliary 1-1/2 KVA transformer
- b. Digital Elapsed Time Meter
- c. Power Fault Protection, Electrical lugs
- d. 3-phase digital ammeter and digital voltmeter readout via control panel, KW Meter, KWh Meter & Ammeter
- e. Voltmeter Elapsed Time Meter

1.2.13 The COP shall not be less than 5.75. The chiller shall be ECBC compliant.

2.0 CONDENSER

## 2.1 Scope

This chapter covers the requirements of water cooled condensers suitable for screw and centrifugal types of refrigeration machines for central air-conditioning. The refrigerant side will be designed, tested and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII- Division 1. The condenser shall have a refrigerant relief device to meet the requirements of the ASHRAE 15 safety code for mechanical refrigeration.

## 2.2 Type: This section covers the following types of condensers:

Water cooled condensers, and Air cooled condensers.

## 2.3 Water Cooled Condensers

### 2.3.1 Rating

i) Where a water chilling unit is required, the condenser capacity shall match the compressor capacity specified in the tender specifications. The condenser shall be selected for 4.2 degree C temperature rise of water through the condenser unless otherwise specified in the tender specifications.

ii) The condenser shall be designed for a fouling factor of 0.001 (FPS) unless otherwise specified in the tender specifications.

Unless otherwise specified, the condenser shall be designed for entering water temperature of 32.2 degree C.

iii) Marine Water boxes shall be provided on condenser. Water boxes will be removable to permit tube cleaning and replacement. Stub out water connections having Victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.

### 2.3.2 Material and Construction

i) The condenser shall be Horizontal shell and tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.

ii) The shell of the condenser shall be made of MS of thickness not less than 8mm, with electric fusion welded seams. The shell capacity shall be such as to hold 1.25 times the refrigerant charge in the machine of which the condenser is a part, under pumped down conditions.

iii) The end plates of condenser shall be made of MS of thickness not less than 25mm.

iv) The condenser shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. Gauge.

v) The tubes shall be of seamless hard drawn copper and finned, unless otherwise

specified. The minimum wall thickness shall be 1.0 mm with root thickness of 0.63 mm below the fins.

vi) Intermediate tube supports of steel shall be provided at no more than 1250 mm intervals to prevent sagging and vibration of the tubes. The condensers shall have water boxes designed for multi pass flow.

vii) The tubes may be provided with special tabulating arrangement to improve heat transfer where such an arrangement is a standard design of the manufacturer.

viii) The condensers shall be provided with removable heads on either side made of cast iron or mild steel with neatly machined surface for effective jointing with the shell for easy accessibility for leaning/replacement of the tubes. Suitable baffles shall be incorporated to achieve the required number of passes. It should be possible to de-scale the tubes without disconnecting the water line connections, wherever marine water boxes have been specified in the tender documents.

ix) The condenser shall be provided with baffle arrangement for preventing direct impingement of hot gas over the tubes and to enable even distribution of the gas over the tube bundles.

x) The condenser shall include necessary provision for sub-cooling of the refrigerant where the refrigerating machine is selected with such sub-cooling requirement. The arrangement shall be such that the cold water entering the condenser first cools the liquid refrigerant in the sub-cooler.

xi) The condenser shall be sand blasted from both inside & outside.

xii) Sight glass to check the level of refrigerant

### 2.3.3 Connections and Accessories

The condenser shall be provided with the following connections and accessories and conforming to Section "Refrigerant Piping" where applicable:

- a) Hot gas inlet and liquid outlet connections. The liquid line connections shall be provided with isolating valves.
- b) Water inlet and outlet connections
- c) Pressure relief device,
- d) Drain connection with valve for water side.
- e) Differential flow switch pressure switch/flow switch/ flow sensor in the water line(s).

### 2.3.4 Pressure Testing

- a) The condenser shall be tested at the works to 1.5 times the maximum working pressure for the refrigerant specified in the tender specifications or 15 kg/sq.cm. (Pneumatic) for refrigerant R-134a, whichever is higher.
- b) The water side of the condenser shall also be tested to a hydraulic pressure of 10 kg./sq.cm.in the works.

c) Pressure test certificates shall be produced in respect of each condenser.

## 2.4 CHILLER

### 2.4.1 Scope

This chapter covers the requirements of chillers suitable for centrifugal and screw types of refrigerating machines for air-conditioning. The refrigerant side shall be designed in accordance with ASME standards (Boiler and pressure vessel) code, Section VIII - Division 1. The evaporator shall have a refrigerant relief device to meet the requirements of the ASHRAE 15 safety code for mechanical refrigeration.

### 2.4.2 Types

This section covers the shell and tube type water chillers.

### 2.4.3 Flooded type shell and tube Type Water Chillers

#### 2.4.3.1 Rating

i) In a package water chilling machine, the chiller shall match the compressor capacity specified in the tender specifications. The chiller shall be selected for 5.5 deg C temperature drop of water through the chiller.

ii) The fouling factor shall be 0.0005(FPS) unless otherwise specified in tender specifications.

#### 2.4.3.2 Material and Construction

i) The water chiller shall be horizontal, shell end tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.

ii) The chiller shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. Gauge.

iii) The end plates of chiller shall be made of MS of thickness not less than 25mm.

iv) The shell of the chiller shall be made of MS of thickness not less than 8 mm with electric fusion welded seams.

v) The tubes shall be of seamless, hard drawn copper. The minimum tube wall thickness shall be 0.71 mm for plain tubes and minimum 0.63 mm at the root of fins.

vi) The tubes may be either plain or internally finned as per manufacturer's design.

vii) The tubes shall be rolled into grooves in the tube sheets and flared at ends.

viii) Intermediate tube supports of steel or polypropylene shall be provided at spacing not less than 1250 mm to prevent sagging / vibration of tubes.

- ix) The flooded chillers shall have water boxes designed for multi-pass flow.
- x) The chiller shall be smooth finished with one coat of paint as per manufacturing practice before the insulation is applied.
- xi) The chiller shall be sand blasted from both inside (before insertion of tubes) & outside.
- xii) Sight glass to check the level of refrigerant

#### 2.4.3.3 Connections and Accessories

The Chiller shall be provided with the following connections and accessories and conforming to section "Refrigeration Piping" where applicable

- a) Refrigeration inlet and outlet connections.
- b) Liquid refrigerant float for level control expansion valve/ fixed or variable orifice.
- c) Pressure relief device.
- d) Charging connection with valve.
- e) Eliminator plate.
- f) Drain and vent connections with valves
- g) Water inlet and outlet connections .Water boxes will be removable to permit tube cleaning and replacement. Stub out water connections having Victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.
- h) Proper oil return system.
- i) Flow switch/pressure switch/differential flow switch/ flow sensor in the water line (s).

#### 2.4.3.4 Pressure Testing

- a) The chiller shall be tested in the works to 1.5 times the maximum working pressure for the refrigerant specified in the tender specifications or 21 kg./sq.cm. (Pneumatic), whichever is higher.
- b) The water side of the chiller shall also be tested to a hydraulic pressure of 10 kg./sq.cm. at the works.
- c) Pressure test certificates shall be produced in respect of each chiller.

#### 2.4.3.5 Insulation

The insulation shall be done as per manufacturer standard.

### 2.5 REFRIGERANT PLUMBING

#### 2.5.1 Design aspects of Refrigerant Plumbing

- i) Refrigerant piping shall be designed and installed so as to:
  - a) Ensure circulation of adequate refrigerant at all loads.



- b) Ensure oil return to crank case of compressor positively and continuously.
- c) Keep pressure losses within limits, especially in suction lines.
- d) Prevent oil/liquid refrigerant from entering the compressor when the compressor is working as well as when it has stopped.
- e) Prevent trapping of oil in evaporator or suction lines, which may return to the compressor in the form of slug.

ii) Hot gas lines:

Oil shall be entrained and carried by hot gas under all load conditions likely to be encountered in normal operation.

iii) Liquid Lines:

- a) Liquid lines shall be designed to ensure that flashing of liquid refrigerant does not occur by minimizing the pressure drop suitably, by avoiding long vertical risers, and appropriate sub cooling.
- b) Each liquid line shall be provided with a permanently installed refrigerant drier of throw away or rechargeable type. The drier shall be installed in a valved line.
- c) Flow indicator (moisture indicating type) shall be installed on all liquid lines.

iv) Suction Lines:

- a) Oil shall be entrained and carried by the suction gas under all conditions of load likely to be encountered in normal operation.
- b) Piping shall be designed for a suitable velocity of refrigerant (similar to hot gas line) to ensure that oil will not separate from the gas and drain to the compressor in slugs.
- c) The refrigeration system shall be equipped with controls for pump down system so that the evaporator and suction line are emptied before the compressor shuts off, thus preventing liquid refrigerant and oil from entering the compressor when restarted.

d) Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg. per sq.cm.(3 psi).

v) Isolating valve shall be provided to enable isolation of each compressor in case of multiple compressor units (as built in valves), strainer, drier and any other components as may be required for proper operation and maintenance.

vi) Thermostatic expansion valve/float valve shall be provided in refrigerant circuit.

## 2.5.2 Material

i) Fittings like bends, tees, sockets etc. shall be of wrought copper or forged brass and shall be suitable for the duty involved. Flare type compression fittings of forged brass shall be allowed up to 15 mm piping size. Tubes up to and including 15 mm size may be bent to form 90 degree bends with inside radius not less than 3 tube diameters. For bigger sizes, bend fittings as mentioned above must be used.

ii) Where specified in the tender specification, mild steel may be provided for refrigeration piping, with seamless MS tubes and fittings of heavy class conforming to IS: 1239. All liquid lines and instruments lines shall however be of copper only.

iii) Refrigerant plumbing for centrifugal/screw type chilling machine shall be of mild steel or wrought iron/copper to manufacturer's standards.

iv) Valves shall be of the packed, back-seating type for both copper and MS refrigerant plumbing work, and these shall be of forged or cast brass construction.

### 2.5.3 Pressure Testing

i) After completion of the piping installation, the entire chilling unit shall be pressure tested with dry nitrogen or any other inert gas at the following pressures:

Pressure (Kg./Sq.cm.)

| High pressure side | Low pressure side |
|--------------------|-------------------|
| 20                 | 8                 |

This test shall be carried out as follows:

a) The system shall be charged with nitrogen or inert gas to 1.0 Kg./sq.cm. gauge and all joints shall be checked for leakage with a mixture of four part water, one part liquid soap and a small amount of glycerin. Leaks shall be marked, pressure released and repairs done. Brazed joints, which leak, shall be opened and redone. These shall not be repaired by addition of brazing alloy to the joints.

b) The system shall now be charged with nitrogen or the inert gas to the pressure specified in the above table and the process of locating leaks and repairs shall be repeated.

c) Final pressure test:

After all the leaks have been repaired, the system shall be retested with the test pressure maintained for a period of not less than 8 hours. No measurable drop in pressure should be detected after the pressure readings are adjusted for temperature changes. Pressure gauges, controls and compressors may be valved off during pressure testing.

## 2.6 MICROPROCESSOR CONTROLLER

2.6.1 Each chilling unit shall be complete with a microprocessor based interactive control console in a locked enclosure factory mounted (directly on the unit), prewired with all operating and safety controls and tested.

2.6.2 It will provide start, stop, safety, interlock, capacity control and indications for operation of the chiller units through alphanumeric/graphical display.

2.6.3 Controls shall provide to view and change digital programmable essential set points, cause of shutdown and type of restart required.

- Leaving chilled water temperature,
- Percent current limit.
- Remote reset temperature range.

2.6.4 All safety and cycling shutdowns shall be enunciated through the alphanumeric/graphical display and consist of day, time, cause of shutdown and type of restart required.

- 2.6.5 Cycling shutdown shall include low leaving chilled water temperature, chiller/ condenser water flow interruption, power fault, internal time clock and anti-recycle.
- 2.6.6 Safety shutdowns shall include low oil pressure, high compressor discharge temperature, low evaporator pressure, motor controller fault and sensor malfunctions.
- 2.6.7 The default display screen shall indicate the following minimum information
- i) Date and time
  - ii) Return and leaving chilled water temperatures
  - iii) Return and leaving condenser water temperatures
  - iv) Differential oil pressure
  - v) Percent motor rated current
  - vi) Evaporator & condenser refrigerant saturation temperatures
  - vii) Chiller operating hours (hour run) and
  - viii) Number of compressor starts
  - ix) Oil sump temperature
  - x) Status message
- 2.6.8 Security access shall be provided to prevent unauthorized change of set points, to allow local or remote control of the chiller and to allow manual operation of the prorogation vanes and oil pump.
- 2.6.9 The chiller shall be provided with ports compatible with any building management system offered, to output all system operating information, shutdown/cycling message and a record of last four cycling or safety shutdowns to a remote printer (option) . The control centre shall be programmable to provide data logs to the printer at a set time interval.
- 2.6.10 Control centre shall be able to interface with an automatic control system to provide remote chiller Start/stop; reset of chilled water temperature, reset of current limit, and status messages indicating chiller is ready to start, chiller is operating, chiller is shut down on a safety requiring reset and chiller is shut down on a recycling safety.
- 2.6.11 The microprocessor control system shall include the interlocking of compressor motor with chilled and condenser water flows, guide vane position of compressor in case of centrifugal units and lubricating oil pump pressure.
- 2.6.12 On initiation of start, the microprocessor control system shall check all prestart safeties to verify that all prestart safeties are within limits. (If one is not, an indication of the fault will be displayed and the start aborted).

## 2.7 INSTALLATION

- i) The complete chilling unit shall be installed over a RCC foundation and shall be adequately isolated against transmission of vibrations to the building structure. MS angle 50\*50\*6 mm shall be fixed all around top edges of such foundation. Where spring mountings are used for vibration isolation, these shall be complete with leveling screws and lock nuts and shall be placed over a concrete plinth for distribution of the mass of the assembly over the plant room floor.

Special attention shall be paid to the alignment of the driving and driven shaft. Final alignment shall be checked at site in presence of the Engineer-in-charge using a dial indicator. Necessary foundation bolts, nuts, leveling screws etc wherever required for mounting the unit shall be provided by the contractor.

## 2.8 PAINTING

The equipment shall be supplied as per manufacturer's standard finish painting.

## **AIR HANDLING UNITS**

### **1. General:**

The air handling system shall be complete in all respects and shall generally comply with the specifications as given in the following paragraphs.

### **2. Air Handling Units: (Double skin type)**

The air handling units shall be double skin, fully enclosed, sectionalised type construction, draw thru type and shall include mixing section, coil section, fan section, filter section with filters etc. The unit shall be of floor mounted design installed on spring/vibration isolators/mountings for limiting vibration to the civil structures.

#### **2.1 Fan Section**

Fan shall be centrifugal with backward inclined blades direct shaft driven or belt driven. Fan casing shall be made of galvanised steel sheet. Fan wheels shall be made of galvanised steel. Fan shaft shall be ground C40 carbon steel and supported in pre-greased ball bearings operating less than 75% of first critical speed. Fan wheels and pulleys shall be individually tested and precision balanced dynamically. The fan shall be selected for a fan speed not exceeding 1000 rpm for fan dia of more than 350 mm and fan outlet velocity shall not exceed 1800 fpm. The fan outlet shall be connected with casing with the help of fire retardant canvas.

#### **2.2 Coil Section**

The cooling coil shall be of seamless copper tubes, not less than 0.5 mm thick and 12 mm dia with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 150 MPM. The coil shall be pitched in the unit casing for proper drainage. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The fins shall be uniformly bonded to the tubes by hydraulic mechanical expansion of the tubes. For coastal areas the fins shall be phenolic coated and for 100% fresh air application fins shall be hydrophilic type. Fin spacing shall not exceed 5 fins per cm. The cooling coil shall be AHRI / Eurovent certified. The cooling coil assembly shall be on aluminium rails and nylon rollers for easy withdrawal from either side.

The coils shall be tested against leaks at 21 kg/sq.cm air pressure under water. This pressure shall be maintained for a period of at least 2 hours. No drop should be observed indicating any leaks. Min.250 mm spacing shall be maintained between the coils. 6 row coils shall be 4+2 construction and 8 row shall be 4+4 construction.

The water headers shall be of copper to connect all the tubes. The headers shall be

complete with water in/out connections, vent plug on top and drain at the bottom. The coil shall be designed to provide water velocity between 0.6 to 1.8 m/s (2 to 6 fps).

### 2.3 **Filter**

Each unit shall be provided with a factory assembled filter sections containing washable synthetic type air filters. Filter framework shall be duly sealed and constructed from aluminium alloy. The media shall be supported with hdp mesh on one side and aluminium frame mesh on other side. Filters face velocity shall not exceed 500 fpm. Filters shall fit so as to prevent by pass. Holding frames shall be provided for installing a number of filters cells in bank. These cells shall be held within the frames by sliding the cells between guiding channels.

### 2.4 **Housing/ Casing**

The casing shall be of sandwich panels fixed on modular frame design The frame work shall be of extruded aluminium hollow section duly powder coat painted/ anodized fitted with extruded Aluminum corner pieces and insulated with 25 mm PUF pressure injected having density 38-40 Kg/m<sup>3</sup> insulation. The structure shall be having thermal break profile for total unit. Panels shall be made of 25 mm thick (overall) sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. For units installed outdoor, the thickness of double skin panels shall be minimum 40 mm. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corners. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of pre coated CRC sheet of 0.8 mm thickness chemically treated, having scratch free pre plasticized coating and 0.8 mm GI inner sheet. The AHU shall be provided with electrical power/control junction box on external side of the unit conveniently mounted for cable connections.

Frame work for each section shall be bolted together with non hygroscopic gasket in between to make the joints air tight, suitable doors with chrome plated hinges and latches shall be provided for access to various panels for maintenance. The entire housing shall be mounted on steel channel frame work.

Units shall have hinged, quick operating access door in the fan section etc. The access doors shall also be double skin type similar to the casing.

Drain pan shall be constructed of 1.25 mm thick SS 304 sheet with necessary dual slope to facilitate fast removal of condensate. It shall be isolated from the bottom floor panels through 15 mm thick PUF insulation.

### 2.5 **Mixing Box**

The construction of this section is same as unit but will have airfoil blade design opposed blade dampers for Return Air, Fresh Air and Exhaust Air as may be required. The casing and frame shall be same as the casing of AHU. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of galvanized sheet chemically treated, having scratch free pre plasticized coating and pre coated GI inner sheet.

## **2.6 Fan Motor and Starter**

The totally enclosed fan cooled squirrel cage fan motor shall have a minimum rating as given under "Schedule of Equipments and the starter rating shall match the motor rating and both control panel shall conform to the specifications under "Motors and Switchgears". Drive to fan shall be provided through belt-drive arrangement. Belts shall be of oil resistant type.

## **2.6 Controls**

Each air handling unit shall be provided with a modulating valve motor and modulating thermostat, conforming to specifications under "Controls".

## **2.7 Fresh Air Controls**

An adjustable motorised damper of aluminium sheet along with bird screen air inlet louvers shall be provided for fresh air entry.

## **2.8 Accessories**

Each air handling unit shall be complete with: -

-Stem type thermometer at coil inlet and outlet. (Included in AHU's)

-Pressure gauges with cocks at inlet and outlet of the coil. (Included in AHU's)

-Balancing valves at coil outlet and butterfly valves at coil inlet & outlet. (priced separately)

-Drain line from unit to drain trap. (priced separately)

-Flexible connection between fan outlet and duct.

-Vibration isolators of high efficiency.

-Ports shall be provided across fine and HEPA filter with Magnehelic gauges to measure pressure drop with bibcock. (Included in AHU's)

## 2.9 Testing

Air handling units shall be tested to measure air quantity and coil performance by measuring temperature difference and then calculating capacity by using the above measurements.

## 2.10 Limitations

The air velocity across the cooling coil shall not exceed 500 fpm.

The fan outlet velocity shall not exceed 1800 fpm

The air velocity across the filters shall not exceed 500 fpm.

## 3. Ceiling Suspended Air Handling Units: (CSU)

The unitary type air handling unit shall be compact, double skin, self contained and shall consist of blower assembly, cooling coil, air filter, drive and motor all enclosed in an attractive sheet steel housing

The blower assembly shall consist of forward curved, double inlet, double width impeller, blower housing of mild steel with smooth air inlet volutes, self aligning bearing block and supports for mounting the bearing on the blower housing.

The cooling or heating coil shall be of seamless copper tubes not less than 12 mm o.d. and 0.5 mm thickness. The coil shall have continuous aluminium plate fins. The fins shall be spaced by collars forming an integral part of the fins. The tube shall be staggered in the direction of air flow. The coil circuit should be sized for adequate water velocity but not exceeding 1.8 m/s (6 F.P.S.). The fins shall be uniformly bonded to the tubes by hydraulic expansion of the tubes. The water headers shall be of copper pipe to connect all the tubes. The header shall be complete with water in/out connection vent plug on top and drain at the bottom.

The air filter shall be of metallic viscous type with a minimum depth of 50 mm. The air filter shall consist of 24 gauge wire mesh in at least five layers with outer casing of 20 ga m.s. sheet formed into channels. Both side of filter shall have expanded metal screens.

The fan motor shall be squirrel cage totally enclosed fan cooled type with suitable



starter conforming to specification under "Motor and Switchgears".

The fan drive shall consist of grooved motor pulley, blower pulley and v belt, along with adjustable mounting for the motor.

All the above components shall be housed in a G.I. sheet steel housing made of 1.2 mm (20 ga) sheets, suitably reinforced to provide rigidity. Access panel to coil and fan areas shall be hinged for ease of maintenance.

### 3.1 **Controls**

Each unitary unit shall be provided with a heating/cooling snap acting thermostat and a 3 way water solenoid valve, conforming to specifications (wherever given in schedule of prices).

### 3.2 **Fresh Air Control**

An adjustable manual damper of aluminium sheet along with a bird screen on the outside wall shall be fixed in the opening provided for this purpose in the air handling unit room.

### 3.3 **Accessories**

Each air handling unit shall be complete with

One stem type thermometer for coil inlet and outlets, with tubing and gauge cocks. (Included in AHU's)

One pressure gauge with cock for inlets and outlets of the coil, with tubing and gauge cocks. (Included in AHU's)

Balancing valve at coil outlet and butterfly valves at coil inlet & outlet (priced separately)

Drain line from unit to drain trap (priced separately)

Flexible connection between fan outlet and duct.

Vibration isolators of atleast high efficiency.

### 3.4 **Testing:**

The air handling unit shall be tested to measure air quantity and coil performance by measuring temperature difference, water pressure drop across coil and then

calculating the capacity by using the above measurements.

### 3.5. **Limitations:**

The air velocity across the cooling coil shall not exceed 500 FPM.

The fan outlet velocity shall not exceed 1800 FPM.

The air velocity across the filters shall not exceed 500 fpm.

## 4.0 **FILTERS**

### 4.1 **General**

This section covers the general requirements for special type of filters to be installed in air moving equipment or air ducts.

### 4.2 **Pre-filters (fabric type)**

Synthetic fibre Pre-filters shall be in light weight aluminium framed with non woven synthetic fibre replaceable media minimum 50 mm thick, shall be provided on suction side of AHU as standard equipment with the unit. These filters shall have the efficiency of 90 percent down to 10 microns particles size when tested as per B.S.2831 standards. The filter frame shall be of aluminium and shall be suitable for mounting in Air handling units or ducts as required at site. The velocity across the face of the filter shall not exceed 500 FPM and the pressure drop across the filter shall not exceed 4mm. The filters shall be suitable for operation under 100 percent relative humidity and 120 deg.C temperature conditions.

### 4.3 **Fine filters (MERV-14)**

Microvee filters shall be of dry type. Filters media shall be made from washable non woven synthetic fibre replaceable media reinforced with HDPE cloth & Aluminum mesh, specially treated with antifungal and bactericidal agents to prevent growth of micro organisms. The filter media shall be treated to permit washing with water several times before discharged. The media shall be properly supported and spaced so that air flow through the filter is uniform. The filter shall be housed in aluminium frame work after the coils. Filters shall be designed to remove particle down to 3 micron size and with efficiency of 99 percent tested as per BS 2831 using Test Dust II. The filters shall be installed in the air handling units after the chilled water coils and fan section and are always backed by pre-filters provided on the suction side of the AHU. Face velocity across these filters shall not exceed 500 FPM. They shall be capable of being replaced or removed for servicing without the use of special tools.

### 4.4 **High Efficiency Particulate Absolute (HEPA) Filters (MERV-17)**

HEPA filters shall be made in extended surface configuration of deep space folds of

sub micron glass fibers. The filter media shall be housed in an aluminium sheet frame provided with double turned flanges and closed cell neoprene gasket. The filter media shall not absorb moisture, stretch, swell or undergo chemical change with moisture. The filter shall be resistant to fungus and bacterial growth. Filters shall be free from pin holes and other leaks.

The housing shall be designed to install the HEPA filters in the terminal locations in the false ceiling or in the Filter section of the AHU after fan section so that it is removed easily without risking the infiltration of dust whatsoever. The arrangement for filters shall be strictly in accordance with the manufacturer's recommendations and shall be approved by the engineer prior to fabrication and installation. The filters shall be protected with aluminium slotted protective grille from the bottom in case of installation of filters in false ceiling air terminals. All MS parts shall be de rusted and shall be epoxy painted. The aluminium grilles shall be made from 1.6 mm aluminium sheets with minimum clear area of 60 percent. The grilles shall be anodised stove enamel painted as approved by the Engineer. Face velocity across these filters shall not exceed 500 FPM.

## **5.0 Heat Recovery Wheel For 100% Fresh Air AHU**

This shall be provided by the AHU supplier of the specified make given in the list of make & technical specification as given below for 100% fresh air AHU as per Bill of Quantities.

The Heat Recovery Wheel (HRW) is based on the concept of both sensible & latent heat recovery between two air streams using corrugated aluminium media rotor synthesized with selective absorbent, suitable for selective transfer of water vapour.

### **Principle of Operation of HRW**

The HRW or rotor slowly rotates between two air streams i.e. outdoor & return air streams. The higher temperature air stream gives up its sensible heat to aluminium (rotor media). The energy is then transferred to the cooler air stream, during the second half of the rotation. Similarly the moisture (latent heat) is transferred from high humidity stream to the low humidity air stream with the help of desiccant coating provided on the aluminium surface. This is so because the desiccant coating provided has very large internal surface area & a very strong affinity to the water vapour. Since the opposing air stream have different temperature & moisture contents, their vapour pressure differ. This vapour pressure differential serves as the sole driving force which promotes the transfer of latent energy.

### **The Substrate for HRW**

The substrate or wheel matrix should be only of pure aluminum foil so as to allow the following:

- a. Quick and efficient uptake of thermal energy.
- b. Sufficient mass for optimum heat transfer

- c. Maximum sensible heat recovery at a relatively low rotational speed of 20 to 25 rpm.

Non-metallic substrates made from paper, plastic, synthetic or glass fibre media, will therefore, not be acceptable.

The substrate shall not be made from any material which is combustible or supports combustion

#### The Desiccant for HRW

The desiccant should be water molecule selective and non-migratory. The desiccant should be of “Ecosorb 340” type, which combines the selectivity of a 3Å molecular sieve desiccant for the 2.8Å water molecules, and has the higher diffusivity of the 4Å molecular sieves, so as to ensure the exclusion of contaminants in the air stream, while transferring only water vapour molecules, resulting in selective and fast latent recovery.

The desiccant, of sufficient mass, should be coated with non masking porous binder adhesive on the aluminum substrate so as to allow quick and easy uptake and release of water vapour. A matrix with desiccants impregnated in non-metallic substrates, such as synthetic fibre, glass fibre, etc. will not be accepted.

The rotor/wheel matrix shall have equal sensible and latent recovery.

The weight of desiccant coating and the mass of aluminum foil shall be in a ratio so as to ensure equal recovery of both sensible and latent heat over the operating range. Accordingly, a rotor matrix which has an etched or oxidized surface to make a desiccant on a metal foil and results in insufficient latent recovery and hence unequal recovery, or a rotor matrix made from desiccant integrated in a synthetic fibre matrix which result in insufficient sensible recovery, high rotation speed, and unequal recovery, will not be accepted.

#### The Rotor for HRW

With optimum heat and mass through matrix formed by desiccant, of sufficient mass, coated on an aluminum foil, the rotor should rotate at lower than 20 to 25 RPM, thereby also ensuring long life of belts and reduced wear and tear of seals. The rotor shall be made of alternate flat and corrugated aluminum foil of uniform width. The rotor honeycomb matrix foil should be so wound and adhered as to make a structurally very strong and rigid media which shall not get cracked, deformed etc. due to change of temperature or humidity.

The rotor having a diameter up to 2800 mm shall have spokes to reinforce the matrix. From 2000 mm diameter upwards, the option of a special wing structure, to prevent the rotors from wobbling or deforming due to the successive pressure differentials, will be available.

Sectioned wheels, with pie segments, capable of being assembled in the field, shall be available as an option, above 2000 mm in diameter.

The surface of the wheel/rotor should be highly polished to ensure that the vertical run out does not exceed + 1 mm for every 1 metre diameter, thereby ensuring, negligible leakage, if labyrinth non-contact seals are provided, and minimal drag, if contact wiper seals are provided.

The radial run out also shall not exceed + 1 mm for every 1 meter diameter, thereby minimizing the leakage/drag on the radial seals, and minimize the fluctuation in the tension of the drive belt.

The number of wraps (of alternative corrugated and flat foil) for every inch of rotor radii shall be very consistent so as to ensure uniform air flow and performance over the entire face in the air stream. Flute height and pitch will be consistent to a very tight tolerance to ensure uniform pressure drop and uniform airflows across the rotor face.

The rotor shall be a non-clogging aluminum media, having a multitude of narrow aluminum foil channels, thus ensuring a laminar flow, and will allow particles upto 800 microns to pass through it.

The media shall be cleanable with compressed air, or low pressure steam or light detergent, without degrading the latent recovery.

#### The Cassette / Casing of HRW

The recovery wheel cassette/casing shall be manufactured from tubular structure to provide a self-supporting rigid structure, complete with access panels, purge sector, rotor, bearings, seals, drive mechanism complete with belt.

#### Purge System In HRW

The rotor / wheel should have a field adjustable purge mechanism to provide definite separation of airflow minimizing the carryover of bacteria, dust and other pollutants from the exhaust air to the supply air. It shall be possible with proper adjustments to limit cross contamination to less than 0.4 % of that of exhaust air concentration.

The face and radial seals shall be four pass non-contact labyrinth seals for effective sealing between the two air streams and also for minimum wear and tear ensuring infinite life of seals.

#### ISOLATORS

Vibration isolators shall be provided with all air handling units for installation on foundation/plinth. Vibration isolators shall be cushy foot mounting type. Minimum vibration isolation efficiency shall be 90%.

#### PAINTING

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining

shop painted surface.

#### PERFORMANCE DATA

Air handling unit shall be selected for the lowest operating noise level of the equipment. Fan performance rating and power consumption data, with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of the installation.

#### TESTING

Cooling capacity of various air handling unit models be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by an anemometer and temperature measurements by accurately calibrated mercury- in-glass thermometers. Computed results shall conform to \the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

## **VARIABLE REGRIGERANT FLOW SYSTEM**

### **1.0 SYSTEM DESCRIPTION :**

The VRV/VRF System should be air cooled, split type air conditioning systems consisting of modular condensing units connected to multiple indoor units, each having the capability of individual set point control. Each modular condensing unit should incorporate inverter scroll compressors to obtain 10% to 100% step less capacity control for enhanced Power saving. The indoor units should be provided with Cordless Remote Control as a standard accessory.

The VRV/VRF units shall be capable of operating within a wide range of ambient temperatures. The Condensing units should be capable of provide cooling within an ambient range of -5 Deg. C to 50 Deg. C DB and heating in the range -10 Deg. C to 15 Deg. C DB.

The COP value should be at least 3.5 & 5 at 100% & 50% load respectively. The contractor has to submit the certificate from OEM confirming the COP values. Each outdoor unit shall have variable inverter technology. Each module should not be more than 18 HP and beyond 36 HP there should be minimum 3 modules. The system shall be all inverter type.

### **2.0 REFRIGERANT:**

The Entire Condensing unit and Evaporating unit should be factory assembled and tested. The units should come with an initial charge of refrigerant R410a from the factory. Any additional required refrigerant shall be added at site free of cost and loss of refrigerant due to defect in equipment or workmanship shall also be filled up free of cost during execution and guarantee period.

### **3.0 REFRIGERANT PIPING DISTANCE LIMITS:**

To be capable of refrigerant piping runs up to 150 m between the condensing unit and indoor units with 50m level difference without any oil traps or double risers. The oil Equalizing line should be inside the Condensing unit, to avoid 'inverted' oil traps at site. The level difference between fan coil units connected to the same refrigerant circuit can be extended to 15m.

#### **REFRIGERANT PIPE WORK:**

The scope of Refrigerant Piping work shall include Supply, installation, testing and commissioning of all interconnecting pipe-work between the condensing unit & indoor units. Refrigerant quality seamless copper tubes with brazed connections and the appropriate Distribution joints and headers shall be used. The piping should be routed at site in such a manner, that brazed joints in the Refrigeration Piping are kept to a minimum. The air-conditioning system supplier shall design sizes and erect proper interconnections of the complete refrigerant circuit.

#### **JOINT ORIENTATION:**

Proprietary Distribution refrigeration pipe joints and headers shall be installed in an

appropriate orientation to enable correct distribution of refrigerant. The Distribution joints shall be factory insulated with pre-formed sections of expanded Polystyrene / equivalent.

#### CLEANLINESS OF PIPING :

All pipe-work must be kept clean and free from contamination to prevent breakdown of the system. All pipe ends shall be kept sealed until immediately prior to making a joint.

#### PRESSURE TESTING :

After complete installation of refrigerant, pipe work shall be pre-pressure tested and repaired if necessary and further pressure tested to 3,800 Pa, to hold for a minimum 24 hours with dry nitrogen prior to insulating the joints. After satisfactory testing, the refrigerant pipe shall be evacuated and dehydrated to (- 755 MM HG) and held for 24 hours depending on the pipe length.

#### ADDITIONAL CHARGE:

Additional refrigerant charge weight must be calculated based on the actual length of the refrigerant pipe work. The refrigerant charging process must be carried out with an appropriate charging station and under supervision of Consultancy.

#### PIPING INSULATION:

All suction lines in the Refrigerant pipe work shall be insulated with as specified to avoid condensation. The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, etc. shall be insulated with 19mm /13 mm thick elastomeric nitrile rubber.

#### FIXING PIPE WORK:

Pipe works shall be fixed supported at a minimum of 2 metre centers suitable saddling arrangement. The exposed Refrigerant pipes on the terrace shall be covered with openable GI Cable trays.

#### 4.0 INDOOR UNITS:

The indoor units shall be hi-wall type as shown in drawings. All indoor units shall be provided with Cordless Remote controls for ease of operation.

#### ELECTRONIC EXPANSION VALVE

Each indoor unit shall be fitted with an electronic expansion valve to control the refrigerant flow in response to the load variations in the room. The electronic expansion valve is to be controlled via a computerized control sensing the return air temperature, refrigerant inlet and outlet temperatures. During the cooling operation the electronic expansion valve shall control the refrigerant superheat degree at the evaporator.

#### INDOOR UNIT FANS

Shall be direct driven, DIDW multi-blade type and statically and dynamically balanced to ensure low noise and vibration free operation. The noise level shall not exceed 42 dbA.



#### COOLING COILS

Shall be direct expansion type constructed from copper tubes expanded into aluminium fins to form a rigid mechanical bond.

#### SUPPLY AIR DISCHARGE LOUVERS

The indoor units shall be provided with auto swing type supply air louvers for indoor units. The louvers shall be capable of providing continuous swing operation or to be fixed in any direction required.

#### UNIT CONTROL BOARD:

It shall include in the indoor unit a printed circuit board complete with, address switches for a variety of operation controls, emergency operation switch and fault / operation indication LED's. The fan motors shall be thermally protected.

#### UNIT CASING:

The indoor unit casing (ceiling mounted units) shall be fully insulated and sealed to prevent condensation.

#### CONDENSATE DRAIN:

The Drain connection of each indoor unit to the main header should be of Min. 25/32 mm dia. The header pipe should be of 40mm dia. The drain pipe should be of hard PVC, whereas the connection of the indoor unit to the hard PVC pipe / GI pipings shall be with flexible braided pipe. The drain piping should be insulated with fire retardant type 9 mm thick tubular nitrile Rubber Elastomeric insulation and the cassette type units shall be provided with condensate drain water pump it should lift the water to the drain headers automatically.

#### UNIT CONTROL:

In case of individual and group control, set the addresses of each indoor unit to minimize commissioning time. In case of centralized control, set the addresses by the remote controller.

#### CONDENSING UNITS:

To be fully weatherproofed, factory assembled and pre-wired with all necessary electronic and refrigerant controls. Construct the casing from mild steel panels coated with a baked enamel finish and powder coatings. The condenser coil fins shall be provided with a corrosion resistant finish.

#### MODULAR DESIGN:

Make provision for side by side installation by the modular design of the condensing units. Each module should not be more than 18 HP and beyond 32 HP there should be minimum 3 modules. Each module must have at least one variable compressor.

#### FAN MOTOR SPEED CONTROL:

The condensing unit fan motors to have at least two speed operations to maintain constant head pressure control in all ambient temperatures and modes of operation.

#### COMPRESSORS:

Provide highly efficient hermetic scroll type compressors. Provide the Digital Scroll/Inverter compressor with electronic controls, capable of loading and unloading to follow the variations on cooling and / or heating loads. The microprocessor panel should incorporate control for precise monitoring of status of the system. The inverter shall be IGBT (Insulated gate bipolar transistor) type to prevent electromagnetic interference & conversion losses for efficient and quiet operation. All parts of compressor shall be sufficiently lubricated. Oil heater shall be provided in the compressor casing.

#### HEAT EXCHANGERS:

The heat exchanger shall be constructed from seamless copper tubes rigid mechanically bonded to Aluminium fins to form a cross fin coil. Treat the Aluminium fins with an anti-corrosion film.

#### REFRIGERANT CIRCUIT:

The refrigeration circuit for the condensing units shall be completed with refrigeration compressors, motors, fans, condenser coils, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut down valves, service ports, receivers and accumulators and all other components which are essential for safe and satisfactory operation.

#### SAFETY DEVICES:

Following safety devices shall be provided as a part of the outdoor unit. High pressure switch, fuses, crank case heater, fusible plug, over current protector.

#### OIL RECOVERY:

The unit shall be equipped with an oil recovery system to ensure stable operation for systems with long refrigerant piping. The oil recovery system shall be operated after the first hour of operation and then every consecutive 4 hours of operation. High efficiency oil separators shall be fitted to the discharge side of the compressor together with factory fitted oil equalization system.

#### SELECTION SWITCHES:

Shall fit the condensing unit printed circuit board (PCB) with selection switches for the length of pipe work, emergency operation switches and service mode switches, together with LED indications for operation / fault indications.

#### CONTROL:

System shall use computerized control to maintain a correct form of temperature. For the indoor units incorporate an on /off switch, fan speed selector, thermostat setting and liquid crystal display which indicates temperature setting. Operational mode, malfunction codes etc.

#### INDOOR UNIT CONTROL:

IT shall be accomplished by individual controllers for each indoor unit.

#### FAULT DIAGNOSIS:

The system shall be equipped with a diagnostic function for quick and easy maintenance and service.

#### CENTRAL REMOTE CONTROLLER:

A multi-functional centralized controller (Central Remote Controller) shall be supplied as specified in price schedule and bill of quantities.

- It shall be able to control up to 64 zones or 64 groups (each group consists of Max. 16 units) or 128 nos. of indoor units with the following functions:-
  - a) Temperature setting for each zone, or group or indoor unit.
  - b) On/off as a zone or individual unit.
  - c) Indication of operating condition
  - d) Select one of 10 operation modes for each zone.
  
- The controller shall have wide screen liquid crystal displays and wired by a non-polar 2 wire transmission cable to a distance of 1 km away from the indoor unit.

## **ELECTROSTATIC AIR CLEANERS (ESP/ DRY SCRUBBERS) FOR KITCHEN EXHAUST**

- 1.0 **Equipment Description:**

The Electrostatic Air Cleaners shall be supplied as a one-piece factory joined assembly of individual section(s) selected to treat oil mist, smoke, fume, grease & dust/ powder problems.
- 2.0 **Unit Housing:**

Housing shall be constructed with minimum 1.6mm thick steel sheet with reinforced structure & powder coated to protect against rust and corrosion. It shall have a hinged door for cell access, located one side of the unit. The door shall be gasketed to prevent air leakage. There shall be a safety interlock switch to cut off primary supply when the access door is opened.
- 3.0 **Finish:**

The external finish shall be a durable industrial grade semi-gloss epoxy-polyester coating suitable for outdoor installations.
- 4.0 **Ionizing-Collecting Cells:**

Ionizing-Collecting cell(s) shall be of one-piece construction 13.38” (340mm) deep in direction of airflow. The dimension of the collection cell shall be 18.89” (480mm) H x 19.76” (502mm)W Max. All support framing, end plates and ionizer ground electrodes shall be 0.080 inch (2mm) thick aluminum. Both repelling and collector plates shall be 0.032 inch (0.8mm) thick aluminum alloy material rigidly retained in place with tubular spacers and tie rods. Each plate shall be corrugated, perpendicular to airflow direction. Spacing between plates shall be no less than 0.318 inch (8mm). Each cell shall weigh at least 17 kg with at least 8 stainless steel spiked blade ionizers. Tungsten wire ionizers will not be accepted.
- 5.0 **Ionizer**

Ionizing spiked blade shall be made of Stainless steel 304 material, rigidly supported both vertically and laterally. Spiked ionizer to ground electrode spacing shall be 1.0" (25mm). High voltage support insulators shall be of Teflon material for dielectric strength. Tungsten wire Ionizers will not be accepted.
- 6.0 **Air handling Capacity**

Equipment should be selected on the basis of required Air handling capacity so as to achieve 90-95% particulate matter removal efficiency according to DOP Test or EN779 European standard (Equivalent to ASHRAE 52.1). Vendor should submit the Test report from the Lab having Test facility according to ASHRAE 52.2 or EN779. In the absence of Test report Vendor should demonstrate the efficiency claim at their manufacturing facility at their expenses.
- 7.0 **Power Supply**

Power supplies shall be 100% solid state, operate on 230 VAC, 50 Hz, 1 Phase input and provide a dual high voltage output of 12-13 KVDC for the ionizer and 6.0-6.5 KVDC for the collector in normal operation conditions. Current output at the high tension shall be 12mA. A maximum power output for the solid state power supply shall be 120 watts to maintain the specified collection efficiency. Integrally mounted Electrical interlocks shall be provided to prevent access to the high

voltage components without first interrupting the primary input power. The power supply shall operate over a temperature range of -32 degrees F to 140 degrees F, be overloaded self-protecting and accommodate an LED lights indicating the performance status of the ionizing/collecting cell. High voltage output components in the power supply shall be sealed with epoxy for moisture resistance.

8.0 Outstanding Features

The power pack shall incorporate a short circuit arc protection with automatic power restoration system to prevent overload.

9.0 Performance Indicator Lights

There shall be 2 LED lights (Green & Red) installed on the access door of the unit to indicate the status of the air cleaning system.

10.0 BMS (Building Management System) interface

The power supply (pack) shall have a 2 wire dry contacts (NO/NC) for remote link to Building Management System. This is for performance indication of the air cleaning system.

11.0 Electrical:

Factory wiring will be in accordance with the National Electrical Code. Required field wiring shall conform to the National Electrical Code and any local code requirements. The manufacturer shall be informed of any local variances to the National Electrical Code.

12.0 EXTRACT FAN – SISW FAN

The Centrifugal blowers shall be single inlet, single width, as given in the BOQ & of non-overloading type of MS construction. The blower performance must be rated in accordance with approved test codes and procedures. The centrifugal fans should confirm to IS – 4894 – 1987 (Revised as on date) The blower housing comprising of scroll & side plates shall be accurately cut of heavy gauge all welded sectional construction and reinforced with angle bracings. Outlets shall be flanged to assure proper duct connection. Inlet cones shall be spun venturi type, to ensure smooth air entry. The base frame shall be angle iron in bolted / welded construction. Impeller shall be fabricated from sheet steel with backward curved, properly designed blades, with heavy C.I. Hub and shall be both dynamically and statically balanced, to a close tolerance for quiet and vibration free performance. Shaft shall be hot rolled steel or forged steel, sized adequately, but in no case or less than 40 mm diameter and shall be accurately ground and polished to a close tolerance. Bearings shall be self aligned, heavy duty ball or tapered roller type with integral dust and grease seals. After assembly, the complete fan shall be painted with fire resistance paint suitable up to 250 Deg C for 2 hours. Fan having wheel diameter of 1220 mm or more, shall be supplied with split, bolted housing for convenience of handling and installation. Motor, bearings and belt drive system should be totally out of the air stream. For outdoor type fan, motor should be in weather proof construction.

Drive assembly for each blower shall consist of blower pulley, motor pulley, and a set of 'V' belts, belt guards, and belt tension adjusting devices. Pulleys shall be selected to provide the required speed. They shall be multi-groove type, with

section and grooves selected to transmit 33% more load than the required power and shall be statically balanced. The belt guards shall be of M.S. sheet with angle iron reinforcements and expanded metal screen. Fan motors shall be energy efficient (IE3) and shall be 415±10% volts, 50 cycles, three phase, totally enclosed fan-cooled class F, with IP-55 protection. Motors shall be especially designed for quiet operation and motor speed shall not exceed 1440 rpm. Fan outlet velocity shall not exceed 10 m/s (2000 FPM).

## **FAN COIL UNITS**

### **1. General**

The fan coil units shall be complete in all respects and shall generally comply with the specifications as given hereunder.

### **2. Fan Coil Units**

2.1 The fan coil units shall be ceiling suspended horizontal /vertical type complete with finned coil, fan section with motor, drain pans, air filters, filter box, fan speed regulator and other controls.

#### **2.2 Cooling Coil**

The coil shall be of seamless copper tubes not less than 9 mm O.D. 0.41 mm thick and shall have continuous aluminium plate fins. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The coil circuit should be sized for adequate water velocity but not exceeding 1.8 M/s (6 F.P.S) the air velocity across coil shall not exceed 500 FPM or 155 MPM the fins shall be uniformly bonded to the tubes by hydraulic expansion of the tubes.

The coils shall be tested against leaks at a hydraulic pressure of 10 kg/sq.cm. This pressure shall be maintained for a period of 2 hours. No drop should be observed indicating any leaks.

#### **2.3 Fan Section**

2.3.1 This shall consist of (2) two light weight aluminium impellers of forward curved type, both statically and dynamically balanced, along with properly designed G.I. sheet casings.

2.3.2 The two impellers shall be directly mounted on to a double shaft, single phase multiple winding motor capable of running at (3) three speeds.

#### **2.4 Drain pans**

2.4.1 The drain pan shall be of double skin construction made of 1.00 mm stainless steel (AISI 304) covering the whole of coil section and extended on one side for accommodating coil connection, valve etc and complete with a 25 mm drain connection. The drain pan shall be insulated with 25 mm expanded polystyrene and covered with second G.I. tray.

#### **2.5 Filter Plenum (Horizontal Type)**

2.5.1 The Plenum shall be part of unit ceiling housing the fans and the coils.

2.5.2 Each unit will have a 15 MM thick washable air Filter made of Nylon mesh filter media in an aluminium frame with 85% efficiency down to 20 micron.

3. **FCU casing**

The Vertical type fan coil units will be provided with plastic cover with a steel casing to house the coil, filter and have space for piping & controls.

4. **Speed Control**

A sturdy switch shall be provided with the unit complete with wiring, for off and with minimum (3) three speed control, of the fan.

5. **Painting**

The fan coil units should be powder coated in suitable colors.

6. **Automatic Controls**

6.1 Each unit shall have a room type thermostat and a 2 way motorized water valve. The valve shall be fixed at a convenient location. The thermostat shall have pre-calibrated thermistor sensors for operation of room temperature between 15<sup>0</sup>C – 35<sup>0</sup>C with a switching differential of 1<sup>0</sup>C. The thermostat shall be suitable for heat cool modes. Thermostat shall have a provision for “temperature set point reset” facility for occupied and unoccupied functions. The thermostat shall be mounted along with the speed control switch on a common plate. The plate shall clearly indicate the fan positions. The controls should be as per specifications under ‘controls’.

6.2 The water valves on inlet line shall be of gun metal ball type with integral water strainers, having BSP(FPT) inlet and flare type mpt outlet connection. The valve on return line shall be as above, but without the water strainer.

7. **Water Connections**

The water lines shall be finally connected to the coil of the fan coil unit, by at least 300 mm long, type 1 seamless solid drawn copper tubing with flare fittings and connections.



## **PAN TYPE HUMIDIFIER**

### **Type:**

The pan type humidifier shall be closed type and connected to the supply air duct for introduction of steam when required.

### **Construction**

The body of the humidifier shall be fabricated out of stainless steel sheet at least 2mm thick with all joints welded with stainless steel welding rods and all edges rounded off. The pan shall be made completely air tight and leak proof. On top of the pan an openable cover shall be provided for maintenance of internal components.

The humidifier shall be externally insulated with Resin bonded fibreglass of density not less than 32 Kg/cub.m and then cladded with 0.8 mm thick aluminium sheet.

The humidifier shall have two chambers with two banks of heaters. One bank of heaters shall always remain ON when the AHU is in operation to maintain the temperature of water between 60 - 70 deg. C and the other bank should come on when there is signal from the humidistat for humidification.

The electric heaters shall be submersible type made out of incoloy sheeth and brass/bronze flanges. The heaters shall be of suitable rating to produce instant steam when required.

### **Electrical panel (For Hot Water Generator/Boiler and Pan type Humidifier)**

The electrical panel box shall be made of 16 GCRC sheet and painted with heat and water resistant paint. All switchgears and internal components of the panel shall be of L&T/ Seimens / EE make only.

### **Controls and accessories:**

The humidifier shall be complete with following controls and accessories:

- a. Water proof light in the tank
- b. Water level indicator
- c. Low water level cutoff switch
- d. Float valve with bronze ball
- e. Make up , quick fill and drain connections
- f. Safety thermostats.
- g. Fault indication lamp.

## **WATER CIRCULATION EQUIPMENTS**

### **A COOLING TOWERS**

#### **SCOPE**

This chapter covers the general requirements of cooling towers for packaged units, central air-conditioning plants and cold rooms.

#### **TYPE**

The cooling tower shall be of Mechanical draft type. Fan on Mechanical draft towers may be on the inlet air side or exit air side. In case of former it is called forced draft type and in case of later it is called Induced draft type. On the basis of direction of air flow and water flow, Mechanical draft cooling tower can be counter flow or cross flow type as per the manufacturer design. This may be of any of the following construction as may be specified in the tender specifications:-

- a) In wooden construction with wood or PVC fill and RCC basin.
- b) In fibre glass reinforced plastic (FRP) construction with PVC fill and FRP basin.
- c) In masonry construction.

The mechanical draft cooling towers of wooden construction and masonry construction, being un-common now, have been excluded from the scope of these specifications.

#### **DESIGN**

##### **i) Rating:**

The cooling tower shall be rated for the heat rejection capacity specified in the tender specifications. All cooling towers shall be certified by CTI (Cooling Tower Institute).

##### **ii) Range:**

The Cooling tower shall be designed to cool the requisite quantity of water through 4.2 degree C or as specified in the tender specifications, against the prevailing wet bulb temperature.

##### **iii) Wet Bulb approach:**

The cooling tower shall be selected for a wet bulb approach of not more than 2.77 degree C.

##### **iv) Outlet temperature:**

The cold water temperature from the cooling tower shall match the entering temperature for which the condenser selection is made.

v) Flow rate:

The water flow rate through the cooling tower shall match that through the condenser.

vi) Multi cell design:

The induced draft cooling tower shall be of one or more cells.

vii) Drive Motor: The fan motor shall be premium efficiency IE3 class, as per IS 12615.

## MATERIAL AND CONSTRUCTION

### Fibreglass Reinforced Plastic (FRP) cooling tower

i) The structural framework of the cooling tower including all members shall be designed for the load encountered during the normal operation of the cooling tower and its maintenance. The structure shall be rugged and rigid to prevent distortion and shall include tie arrangements as may be necessary.

ii) The cooling tower shall be induced draft type, with FRP casing in square/ rectangular/ octagonal/ circular shape, and with an FRP basin to match the shape of the casing.

iii) The air intake shall be from openings all along the circumference of the casing near its base in case of circular shape. Air Intake shall be along the sides in case of square or octagonal/ rectangular cooling tower. These openings shall be covered with hot dip galvanised expanded metal mesh screens.

iv) The basin shall have a holding capacity adequate for operation for at least 30 minutes without addition of make-up water to the basin. The construction should be such as to eliminate the danger of drawing air into the pump when operating with minimum water in the basin.

v) The basin fittings shall include the following: -

a) Bottom /side outlet,

b) Drain connection with valve,

c) Ball type automatic make-up connection with valve,

d) Overflow connection,

e) Bleed off with valve, from inlet header to overflow pipe.

vi) The supporting framework for the tower casing and the water basin shall be made of hot dip galvanised steel and it shall be further protected with epoxy painting.

vii) The filling shall be of PVC. Thickness of PVC fills shall not be less than 0.2mm. These shall be of such construction as to provide low air resistance, large wetted surface for a high heat transfer efficiency, and easy replace ability.

viii) The water distribution may be either through self-rotating or fixed type sprinklers or through balancing, sub balancing and spreader troughs (unpressurised system) “open gravity type with polypropylene nozzle□”, ensuring uniform water loading and distribution of water over the fill. All pipes and fittings shall be of PVC. The sprinklers shall operate from the residual velocity head at the headers. Due care shall be taken with regard to corrosive effects and maintainability in the design of the water distribution system.

ix) Drift eliminators of PVC shall be provided for maximum removal of entrained water droplets. The spacers and tie rods used shall be of plastic material.

x) The fan shall be multi-blade axial flow type, made of aluminium alloy or FRP. The fan assembly shall be statically and dynamically balanced.

xi) The fan drive shall be from a three phase induction motor of efficiency class IE3 as per IS 12615, either direct or through a spiral gear work. The entire drive arrangement shall be designed for a minimum noise and it shall be rigidly supported to the tower structure.

xii) The motor starter shall be as following:-

The motor starter shall conform to IS: 1822 —Motor starters of voltage not exceeding 1000 volts□ and shall be air insulated and suitable for 415 volts, + 10%, 50 Hz., 3 phase AC supply. Enclosures shall have protection of IP 55 for outdoor applications.

Starter for the motor shall be direct on line (D.O.L) for motors up to and including 7.5 H.P. rating and automatic star-delta close transition type for motors of higher ratings unless otherwise specified in the BOQ. Starters shall be rated for continuous duty. Starting current should not exceed two times the full load current.

Each starter shall be provided with the following protections: -

a) Thermal overload on all the three phases with adjustable settings.

b) Under voltage protection.

c) Independent single phasing preventor. (Current sensing type)

Adequate number of extra NO/ NC contacts for interlocks, indicating lamps etc. shall be provided on the starter/ contactor.

xiii) To ensure safety of personnel at the time of working on cooling tower a steel ladder shall be provided in such a manner and location as necessary to give safe and complete access to all the parts of the cooling tower requiring inspection or adjustments. The ladder shall be bolted to the tower at the top and grouted in masonry at the bottom end.

## INSTALLATION

The cooling tower shall be installed on M.S. girders fixed in masonry foundations with cement concrete footing or as per manufacture standards. Second class brick work and cement mortar having one part cement & six parts sand shall be used for the masonry work 12mm sand cement plaster shall be provided over the brickwork.

These may be located at a well-ventilated place either at ground level and contiguous to the plant room, or on the terrace of the building in consultation with the Architect. In case the cooling towers are located on the terrace of the building, the structural loading of the terrace shall be considered. For this respective columns are to be raised by two feet at the terrace. Cooling towers shall be installed in such a way that their load is transferred directly to the columns for which necessary Mild steel-I sections shall be provided by the air-conditioning contractor. The cooling towers shall be rested on Mild Steel-I sections & not on terrace slab. Sufficient free space shall be left all around for efficient operation of the cooling tower.

Cooling tower shall be not less than 75cm above the ground/ floor level unless otherwise stated in the tender specifications. 6mm neoprene pads shall be placed between the tower and the girder for vibration isolation whereas directed by the Engineer-in-charge. Guy-wires of suitable sized shall be used to secure firmly to its base wherever necessary.

**PAINTING**

The cooling towers shall be supplied with the manufacturer’s standard finish painting.

**B SPLIT CASING PUMPS**

The centrifugal pumps shall be used for chilled water re-circulation in the air conditioning system. The pump shall be back pull out top discharge split casing type as per the requirements given in the schedule of equipments and bill of quantities. The capacity of the driving motor shall be at least 25% in excess of the BHP requirement of the pump.

**1.1 Construction.**

The split casing pumps shall conform to ISI 1520 and the construction of the pumps shall be as follows.

| S.NO. | DESCRIPTION OF COMPONENT | MATERIAL / TYPE OF CONSTRUCTION   |
|-------|--------------------------|---|
| 1.    | Pump Casing              | Close grained cast iron of heavy section, end suction back pull out type and machined to close tolerance. |

- |    |               |  |
|----|---------------|--|
| 2. | Impellar      | Bronze/Gunmetal machined to close tolerance.                       |
| 3. | Pump Shaft    | High quality alloysteel EN8 grade.                                 |
| 4. | Pump Bearings | Heavy duty/ball/roller/ journal bearings.                          |
| 5. | Shaft sleeves | Gun metal.   |
| 6. | Base frame    | Cast iron/fabricated out of MS channel in all welded construction. |
| 7. | Flanges       | As per ISI standards.  |
| 8. | Stuffing box  | Mechanical seal.   |
| 9. | Pump coupling | Flexible steel pin and rubber bushing type protected by guard.     |

## 1.2 CONSTRUCTION DETAILS.

The pump casing shall be end suction vertical back pull out type and the pump shall be installed such that the internal parts of the pump like impeller, mechanical seal and bearing etc can be serviced without disconnecting the pipes or disturbing the motor and pump alignment. The joining faces of the pump casing shall be machined and ground to smooth finish and sealed with leak proof gasket. The suction passages of the pump shall be volute in form thereby allowing smooth entry of water to the impeller. The impeller shall be double suction, enclosed type, statically and dynamically balanced. The impeller water passages shall be smoothly finished to ensure minimum friction loss and maximum efficiency. The pump shall be supported by two precision bearings grease or oil lubricated. The pump casing and the internal components shall be designed to withstand the discharge pressure plus the static water head + additional 50% of the total pressure.

## 1.3 Pumps for Variable Speed Drive

1.3.1 The pumps for variable Speed Drive should be similar to the Vertical Split Casing given above.

1.3.2 However, the pump selected for variable speed drive shall be capable of performing satisfactorily over a wide range of speed, allowing a speed variation between 30% to 100%.

1.3.3 The pump motor shall be controlled by Variable Frequency Drive (VFD), instead of standard starters.

## 2. **Variable Frequency Drive (VFD)**

- 2.1 The variable frequency drive shall be micro-processor controlled design complete with a controller suitable for automatic control of operation based on an external signal from sensor or BMS.
- 2.2 Each pump shall have an independent VFD.
- 2.3 However, the Microprocessor based controller shall be common for each set of pumps in a particular application.
- 2.4 The drive shall have a key pad control and a LED display module, alongwith a manual ON/OFF and bypass switch.
- 2.5 The drive shall have a diode bridge rectifier to convert 3-phase AC to fixed DC voltage power factor shall remain above 0.98.
- 2.6 The drive shall be capable of displaying the following information, such as, frequency, voltage, current, KWH, percent torque, percent power RPM etc.

## 3.0 **PUMP ACCESSORIES.**

The following accessories and fixture will be provided with each pump along with other standard accessories.

- a. Air vent valves.
- b. Drain Plug.
- c. Seal Connections.
- d. Lubrication fixture & mechanical seal.
- e. Suction & delivery shut off valves.
- f. Non return valve.
- g. Water pressure gauges on inlet and outlet pipes. (Included in pumps)
- h. Y-type strainer on suction pipe.

## 4.0 **PUMP MOTOR & STARTER**

The driving motor shall be totally enclosed fan cooled type with class `B' insulation. The motor shall be designed for quite operation and its speed shall not exceed 1450 RPM. The motor starter shall be star-delta type. The starter shall have thermal overload on all the 3 phases and single phase preventor. The starter shall have spare NO/NC contacts for interlocking and indication lamps.

#### **5.0 INSTALLATION OF PUMPS.**

The installation of pumps shall be carried out by the contractor as per the manufacturer's - recommendations.

The pumps shall be installed on concrete foundations with at least 25mm thick vibration isolation pads or any other vibrating isolation fittings. The pump and the motor shall be installed on a common steel frame and properly aligned. The alignment of the pump and the motor and the base plate level shall be checked at site and the result submitted to the Engineer in charge. As far as possible the pumps sets shall be factory aligned and if site alignment is necessary it shall be done by experienced and trained personnel. The pumps shall be installed in a manner that the maintenance can be done conveniently. The chilled water circulation pumps shall be insulated in a manner specified under section `Insulation'. The insulation shall be done in such a manner that maintenance can be done on the pumps without causing damage to the insulation.

#### **6.0 TESTING**

The contractor shall submit the manufacturer's performance curves for the pumps supplied by him. Tests shall be conducted on each pump set after completion of the installation to check and confirm the delivery load, water flow rate and the BHP. The test results shall correspond to the performance curves. The pumps performance shall be computed from the manufacturer's pump curves.

All equipment instruments and labour required for testing shall be furnished by the contractor at no extra cost.

#### **7.0 PAINTING**

The pumps along with the base, motor and accessories shall be painted with two coats of synthetic enamel paint of approved colour after testing and commissioning. valves and vent piping as required.



## **VENTILATION FANS**

### **1.0 Codes and Standards:-**

The design, materials, construction, manufacture, inspection, testing and field performance of the centrifugal fans shall comply with all currently applicable international / national codes / safety regulations. In particular the equipment shall conform to latest editions of all applicable codes and standards listed below.

AMCA-201 - Fans and systems - Application guide

AMCA-203 - Field performance measurement of fan systems

AMCA-210 -Laboratory Methods of testing Fans for Aerodynamic performance rating.

AMCA-2404 - Drive arrangements for centrifugal fans

### **2.0 Centrifugal Fans:-**

#### **2.1 Design Requirements:-**

The design parameters for the centrifugal fans shall be as below.

#### **2.2 Design and Constructional Features:-**

##### **a. General**

a.i Centrifugal fans shall be DIDW / SISW in simply supported arrangement (i.e. Bearings on both the sides) construction complete with access door, squirrel cage induction motor, outlet damper, base frame, canvass connection, V belt drive set, belt guard, foundation bolts, nuts, slide rail and vibration isolators. Direction of discharge / rotation and motor position shall be as per the good for construction shop drawings. All centrifugal ventilation fans shall be AMCA (Air Movement and Control Associates Incorporation of USA) certified for air performance & sound. Critical speed of the fan shall be minimum 125 % higher than the operating speed. Centrifugal Exhaust fans / motor and other accessories for toilet exhaust system shall be suitable for outdoor applications.

a.ii The Fans shall be AMCA Certified and performance certificate for the particular model of fans being supplied shall be submitted by the contractor.

##### **b. Housing:-**

b.i Housing shall be of welded construction, fabricated from carbon steel material with suitable reinforcement for rigidity. It shall be rigidly reinforced and supported by structural angles. Split casings shall be provided for large size fans, however neoprene packing shall be provided through split joints to make it airtight. Cut-off shall be designed to give smooth and quiet airflow from the outlet. Fan housing shall be of welded construction and provided with flanges at outlet for duct connection. Thickness of casing shall be as per manufacturer's standard & factory practices.

b.ii The distance between blade tips and cut-off shall be optimally fixed to reduce pressure pulsation. Inlet and outlet shall be flanged.

b.iii Housing shall be provided with standard clean out door with handles and neoprene

gasket.

b.iv Inlet cone shall be spun to have deep smooth contour. Close tolerance shall be maintained between inlet edge and the impeller shroud. Inlet cone profile shall ensure a smooth flow of air to blades. Inlet screens shall be provided for open inlet fans. Inlet guards shall be of 18 gauge galvanized wire mesh with 5 mm sieves. Inlet guards shall allow access for lubrication as required.

**c. Impeller (Rotor):-**

c.i The impeller shall be backward curve or aerofoil sectioned blades of non – over loading type. The Impeller blades shall be welded to back plate/center and shroud all along the length. Shroud shall be spun to have a smooth contour. Shaft sleeves shall be furnished as required. The impeller, pulley, and shaft sleeves shall be positively secured to the shaft. The locking device shall be designed to take the full torque due to momentum of impeller when the shaft suddenly gets arrested while running at operating speed. Air passages shall be free of interference.

c.ii Maximum operating speed of the fans shall be selected to maintain the fan outlet velocity of 2000 FPM (10.15m/s) and Noise level shall not exceed 75 db(A) at 3 mt. Distance from the equipment. The impeller along with driven pulley shall be balanced statically and dynamically after assembly. Balancing shall conform to minimum G 2.5 grade (as per ISO-1940) or Superior grade.

**d. Shaft:-**

d.i Shaft shall be properly sized for single piece hollow or solid construction of hot rolled steel and it shall be turned, ground and polished. Fan shaft shall not pass through its first critical speed at rated speed.

d.ii Fan shaft shall be of EN8, SAE-1040, SAE-1035 or equivalent .

**e. Bearings:-**

Fans shall be equipped with amply sized taper roller or ball or spherical roller anti friction or self aligning pillow block type bearings with integral dust and grease seals. Bearings shall be charged with grease. The grease capacity of the bearings shall be such that the fans are suitable for continuous operation for at least 12 months before re-greasing is required. Bearings shall be selected for a life of 50,000 hours and same shall be as per IS-3824. Grease fittings shall be 6mm button head type.

**f. Drive Motor:-**

The fan motor, suitable for the centrifugal fan drive shall be supplied by the contractor and the same shall be as per the specification. Motors shall be designed for continuous duty operation and shall have high efficiency. Drive motor shall have minimum 20 % margin over the fan limit load horse power. Motor shall be designed especially for quiet operation and motor speed shall not exceed 1440 rpm. The same shall be capable of accelerating to the rated rpm within safe stall time. The contractor shall submit the motor and fan torque characteristic curves along with other details for fan and motor in support of the selection.

The fan and motor combination selected for particular required performance shall be of most efficient and shall be for quiet running characteristics and high efficiency. Fan motor selected shall be in such a way that sound level is lowest (max. 75 db) while running. The power and efficiency factor for all motors shall be submitted along with offer. Motor shall be capable of running continuously with a 5 % drop in rated phase to phase voltage at 15 % increase in design power. Motor of 0.75 KW and over shall be fitted with integral positive temperature coefficient thermistors selected to afford class 1 protection. Motors below 0.75 KW shall be fitted with inherent over heat protection. The Motors shall be TEFC type with IP-55 Protection & Class 'F' Insulation. Motors shall be designed for 415 V +/- 10% & 50 HZ +/- 3 %.

**g. Drives:-**

Fans may be direct or belt driven. In case of belt driven fans, there shall be a minimum number of two belts per drive. All belt driven fans shall be equipped with fully enclosed belt guards with speed measurement openings and shall be easily removable. Belts shall be of oil resistant type. Belt guards shall not impede the airflow to the fan inlet. All belts shall be selected based on a service factor of 1.5 as applied to the drive motor kW rating. Should one belt fail the remaining belt(s) should be capable of carrying the full load. All belts shall be sized for 150% rated horsepower. The minimum number of belts to be provided will be as follows:

In case of direct drive, a hypoid gear coupling or flexible coupling of standard design shall be used. Pulleys shall be selected to provide the required speed. They shall be multi-groove type, with section and grooves selected to transmit 33% more load than the required power and shall be statically balanced. The belt guards shall be of M.S. sheet with angle iron reinforcements and 18 gauge expanded metal screen

**2.3 Accessories:-**

**a. Common Base Frame:-**

Mounting skid of structural steel shall be provided for supporting the fan & motor base frames. Mounting skid shall be bolted / welded with the embedded plates provided on the floor. Fans shall be fixed on mounting skid with vibrations isolators mounted in between.

**b. Access Door and Drain Connection:-**

Access door shall be provided for periodic inspection or cleaning. The door can be either toggle clamp fixed or as per manufacturer's standard design. Drain point with plugs or valves shall be provided if specified.

**c. Outlet Damper:-**

Fan shall be provided with a damper at outlet. Dampers at outlet of centrifugal fan shall be manually operated multi-louvered type with neoprene edging on blades for tight shut off. Each blade shall be provided with bronze/gun metal bearing at each end of spindle. Operating lever along with the necessary linkage shall be provided at an accessible position for operating the dampers. Suitable fixing device for locking the damper at desired position should be provided.

#### **d. Flexible Connection:-**

Flexible connections shall be provided on the suction / discharge ends of the fan as specified. The flexible connection shall be of heavy gauge double canvas / Neoprene impregnated glass fiber of length not less than 150mm.

#### **e. Nuts & Bolts:-**

All bolts, nuts & locknuts shall conform to IS: 1367. Self-tapping screws shall not be used.

### **2.4 NOISE & VIBRATION:-**

a. The vibrations measured at bearings in both radial and axial direction shall not exceed the specified range in the "Good to very good region" of general machinery vibration chart of VDI-2056. The vendor shall furnish along with their offer the overall fan sound power level for each fan and motor operating at the duty conditions.

b. Vibration isolators of proven design for specified isolation efficiency shall be provided. Double deflection rubber in U shear or cushy foot vibration isolator or spring type isolators shall be provided for each fan. Rubber bushes, washers, wherever needed for the vibration isolators shall be included in the supply. Sufficient number of such isolators shall be provided to ensure isolation of foundation from vibration of the equipment. At the commissioning stage the vibration amplitudes shall be measured to ensure that the vibrations are within the permissible limit of 30 microns. Generally fans / motors shall be selected to run at very minimum vibration level in accordance with the standards and the fans which are to be mounted on the terrace floor should be selected in such a way that it will not transmit any vibration and sound to the office floors below.

### **2.5 Painting:-**

Fans shall be painted on exterior and interior with two coats of red – oxide zinc chrome primer confirming to IS: 2074 or superior, over which 2 coats of synthetic enamel of approved shade shall be applied on all surfaces. Centrifugal fans / accessories which are to be installed on the terrace floor shall be suitably painted on exterior and interior surface to avoid corrosion, these fans / accessories are to be specially treated to take care of the adverse weather condition.

### **2.6 Accessories**

All necessary accessories shall be provided for proper operation and shall also include (As part of Unit Price).

- a. Dunlop cushy foot vibration isolators for the blowers.
- b. Double canvass connections at the outlet of each fan.
- c. Nuts, bolts, shims etc. as required for the grouting of the equipment.
- d. Slide rails for mounting the motor and belt adjustments.
- e. 18 gauge galvanized wire mesh bird screens in the Inlet.
- f. Outlet damper.

### **3.0 Axial Flow Fan:-**

All fans shall be AMCA (Air Movement and Control Associates Incorporation of USA) certified for air performance & sound.

**a. Impeller:**

The impeller shall be of die cast aluminium alloy with integrally cast aerofoil sectioned blades and hub. Impeller shall be fixed to motor shaft by a thrust plate and bolt reverse to direction of rotation, in addition to key lock. The critical speed of impeller shall be minimum 1.5 times of the operating speed. The impeller shall be statically and dynamically balanced to G 2.5 grade as per ISO: 1940.

**b. Casing:-**

Casing shall be of 2mm thick MS for impeller dia up to 600mm and 2.5mm thick MS for impeller dia above 600mm or as per manufacturer's standard and factory practices. Casing shall have flanged connection on both ends for ducted application. It shall be provided with suitable supports. Access door shall be provided in the casing for easy access to motor and impeller. Suitable arrangement for mounting of motor shall be provided.

**c. Guide Vanes:-**

In case of vane axial fans guide vane shall be provided on the discharge side.

**d. Guards:-**

Suitably designed guards shall be supplied.

**e. Drive Motor:-**

Motor shall be of totally enclosed fan cooled type squirrel cage induction of IP-55 protection and class-F insulation suitable to run on 415+/-10% Volts, 50+/-3% Cycles, 3-phase AC power supply. Motor conduit box shall be mounted on exterior of fan casing, and lead wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit. Fan motor shall be selected in such a way that sound level is lowest (max. 75 db at 3 m distance) while running. The motor shall be rated for continuous duty. The power and efficiency factor for all motors shall be submitted along with the offer. Motors shall be capable of running continuously with 5 % drop in rated phase to phase voltage at 15 % increase in design power. Motors shall be fitted with inherent over heat protection.

**f. Speed:-**

The speed of the fan shall not exceed 960 RPM for fan with impeller diameter above 1000 mm and 1440 RPM for fan with impeller diameter 1000 mm and less.

**g. Painting:-**

Fans and accessories shall be painted with two coats of red-oxide primer zinc chrome primer confirming to IS: 2074 or superior, over which two coats of synthetic enamel of

approved shade shall be applied.

#### **4.0 Propeller Fan:-**

Propeller fans shall be direct driven, three or four blade type, mounted on a steel mounting plate with orifice ring. The blades shall be of steel and designed such as to give maximum volume at minimum noise level for minimum power consumption. The impellor shall be directly coupled to a purpose designated motor for efficient operation. Fan / motor shall be suitable for continuous duty and shall perform satisfactorily in ambient temperature of above 50 deg. C. The contractor shall furnish along with their offer the overall fan sound power level for each fan and motor operating at the duty conditions.

##### **a. Mounting Plate:**

Mounting plate shall be of steel construction, square with stream lined venturi inlet (reversed for supply applications) coated with backed enamel paint. Mounted plate shall be of standard size, constructed of 12 to 16 gauge sheet depending up on the fan size. Orifice ring shall be correctly formed by spinning or stamping to provide easy passage of air without turbulence and to direct the air stream.

##### **b. Fan Blades:-**

Fan blades shall be constructed of mild steel. Fan hub shall be of heavy welded steel construction with blades to the hub. Fan blades and hub assembly shall be statically and dynamically balanced at the manufacturer's works. Impellor hubs and blades, fan supports, wire guards and internal surfaces of fan chambers shall have smooth finish.

##### **c. Shaft:-**

Shaft shall be of steel, accurately ground and shall be of ample size for the load transmitted and shall not pass through first critical speed through the full range of specified fan speeds.

##### **d. Motor:-**

Motor shall be standard (easily replaceable) permanent split capacitor or shaded pole for small sizes, totally enclosed with pre – lubricated sleeve or ball bearings, designed for quiet operation with a maximum speed of 1000 rpm for fans 38 cm dia or larger and 1440 rpm for fans 30 cm dia and smaller. Motor for larger fans shall be suitable for 415 +/- 10% volts, 50 cycles +/- 3%, 3 phase power supply and smaller fans shall be suitable for 220V +/-10%, 50 cycles +/- 3 % single phase power supply. Motors shall be suitable for either horizontal or vertical services as indicated on drawings / Schedule of quantities. Motor selected shall fully comply with the specifications mentioned elsewhere. Fan / Motor selection shall be for continuous and quiet operation and the measured noise level shall not exceed 50 db (A) at 1 meter distance from the equipments. Motors shall be TEFC type with IP-55 protection & class 'F' Insulation.

##### **e. Accessories:-**

The following accessories may be required and provided with propeller fans, as indicated in Schedule of quantities.

Wire guard on inlet side and bird screen at the outlet.  
Fixed louvers built in to a steel frame.  
Regulators for controlling fan speed for single phase fan motors.

### **5.0 Inline Fans:-**

- a. Inline fans shall be complete with centrifugal impeller, casing, direct driven motor, vibration isolators, direction of discharge and rotation position shall be as per the job requirement and shall be marked on the fan assembly.
- b. Housing shall be constructed of hot rolled GSS sheet metal construction of suitable thickness. Housing metal parts shall be either spot-welded or screwed or mounted together with rivets. Indication showing rotation arrow and make, model number and duty conditions of the fan shall be available on the housing.
- c. Casing shall be with wide hinged doors which open easily inspection doors with handle and neoprene gasket shall also provided. Casing shall have flanged connection on both ends for ducted applications. Casing shall be primed and finish coated with synthetic enamel paint. Extended grease leads for external lubrication shall be provided.
- d. Fan wheel shall be forward curved type, statically and dynamically balanced.
- e. The fan shall be provided with ball bearings can be used in any mounting position at maximum indicated temperature. The bearing lubricant shall be suitable for a minimum ambient temperature of minus 150C (admissible for a short time without reaching dew point at minus 300C). For applications at maximum indicated ambient temperature life expectancy shall be 40000 hours minimum.
- f. Fan motor, fans shall be supplied with built-in-thermal contact (TK) at the critical high temperature point ("B" = 1300C. The thermal contact shall open and break the power supply to the fan.
- g. Motor shall be squirrel cage, totally enclosed, fan cooled standard round frame, constant speed, continuous duty, single winding, suitable for single phase supply (220V +/- 10%, 50 Hz +/- 3%). Motor shall be specially designed for quiet operation and lead wires from the motor to be conduit box shall be protected from the air stream by enclosing in a flexible metal conduit.
- h. Fans shall be direct driven type.
- i. All fans are hot dipped galvanized.
- j. The assembly of fan and motor shall be suspended from the ceiling by spring type vibration isolators.

### **6.0 Fire Rated Smoke Exhaust Axial Fan:**

- a. The fire rated smoke exhaust fans generally shall be as described above suitable for 250oC for minimum 2 hours.

- b. The blades shall be of aluminum alloy fixed on an aluminium hub-flange assembly suitable for multiple blades which shall be adjustable when the fan is stationary.
- c. The collar shall be constructed of rolled steel and joints welded. The flanges shall have suitable holes for fixing the fans, ducts etc. The collar and flanges shall be galvanized for protection.
- d. The collar shall be long to cover fan and motor.
- e. The fan shall be supplied with factory mounted TEFC motor suitable for 250oC for minimum 2 hours. The motor shall be foot mounted.
- f. The fan shall be approved for 250oC for 2 hours by international / national authorized agency.
- g. The speed of the fan shall not exceed 960 RPM for fan with impeller diameter above 1000 mm and 1440 RPM for fan with impeller diameter 1000 mm and less.

#### **7.0 Fire Rated Centrifugal Fan:-**

- a. Fire rated centrifugal fan generally shall be as described above and may have varied construction features as required.
- b. The fan shall be supplied with factory mounted TEFC motor suitable for 250oC for minimum 2 hours. The motor shall be foot mounted.
- c. The fan shall be approved for 250oC for minimum 2 hours by International / National authorized agency.

#### **8.0 Limitation:-**

The air velocity limits shall be as below:-.

Velocity at blower outlet shall not exceed 12 M/S

Inlet Velocity shall be limited to 5.08 M/S (1000 FPM).

#### **8.1 Life of Ventilation & Smoke Exhaust Fans:-**

Ventilation & Smoke Exhaust Fans shall be capable of providing average service life of 25 years.



## **Kitchen Scrubber**

### **1. General**

The kitchen scrubber shall be complete in all respects and shall generally comply with the following specifications given below :

### **2. Air Washers**

2.1 The scrubber shall be of 16G G.I. Sheet metal fan section, mixing box and SS-304 made spray section, filter section and eliminators.

### **2.2 Enclosure/Housing**

2.2.1 Enclosure shall be made of powder coated 18 gauge GI sheet with riveted and soldered lap joints casing angles shall also be of 40mm x 40mm. Angle shall be riveted and soldered to the casing.

2.2.2 The front panels shall be easily open-able for servicing the fan sections. It should provide easy access to remove air filters for cleaning.

2.2.3 The opening for access doors and gaps between sections shall be provided with the neoprene rubber T-gaskets fixed in grooves in the extruded sections.

2.2.4 The panels shall be fixed to the frame work with self tapping stainless steel screws and both ends of the screw shall be provided with rubber caps.

2.2.5 The access door to fan section is to be provided with a switch to shut the fan when the door is open.

### **2.3 Fan Section**

2.3.1 The impellers of the fan or fan shall be of GI sheets, double inlet forward curved centrifugal design, both statically and dynamically balanced. The fan housing shall be of sturdy construction made from 16G (1.6mm) GI sheet with smooth air inlets. The fan shall be mounted on properly aligned shaft and mounted on self aligning bearing blocks. The casing of the cab section shall be made of 16G (1.6mm) GI sheets suitably reinforced to provide rigidity. The frame work shall be either be folded GI sheets or of hot dipped galvanized iron.

### **2.4 Spray Section**

2.4.1 Spray section and tank shall be fabricated from 18 G 304 A stainless steel sheets with bolted construction having suitable stiffeners.

2.4.2 The section shall be complete with SS 304 water distribution header having ports and sized for uniform and adequate water flow through perforated SS 304 pipes. The spray nozzles shall be of brass construction.

- 2.4.3 The tank shall be fitted 3/4" (20 MM) float valve of commercial grade brass.
- 2.4.4 The spray section shall have provision for fixing one or two sets of air filters as specified later.

## 2.5 **Water Sump**

- 2.5.1 The water sump below the spray section shall be of 3mm MS plate with welded joints. The tank shall be complete with makeup, overflow and drain connections. A float valve shall be provided for makeup water line. The tank shall be given 2 coats of corrosion resistance paint and final coat of black enamel paint.

## 2.6 **Drift Eliminators**

- 2.6.1 Drift eliminators shall be of PVC supported at the top and bottom fixed to the spray section by means of GI notched bars. Eliminators shall be a set of vertical plates with a series of bends and deflections to give large surface area on which water drops and dust shall be impinge. Eliminators shall be properly stiffened at the sides.

## 2.7 **Distribution Plate**

- 2.7.1 Distribution plate shall be GI 18G with sufficient number of circular opening uniformly spaced for even distribution of air for spray type air washer.

## 3. **Pumps**

- 3.1 The water distribution pumps shall be of heavy duty, vertical type mounted inside the tank. It shall be complete with adjustable bleed of arrangement to prevent concentration of undesirable salts.

## 4. **Grease Filter & Carbon filter**

- 4.1 The standard pre-filters shall be with 5 layers of SS-304 wire mesh, fixed in a 22 G GI frame with handles for ease of removal.
- 4.2 The above set of filters shall be fixed in filter frames made of 22 G.I. sheets, shaped to prevent air leakage. The filters shall be easily removable. The filter section may from part of the spray section or may be bolted separately to the spray section.
- 4.3 Carbon filter shall be installed to eliminate the particles in the smoke.

## 5. **Motors and Starters**

- 5.1 The motor for each blower, shall be totally enclosed, fan cooled, squirrel cage induction type and conform to specifications as given under section 3.
- 5.2 The starters shall be "direct on line" type up to 7.5 H.P. All larger starters shall be of fully automatic star delta type.
- 5.3 The pumps shall be provided with single phase, self tripping starter of "North West" make.

6. **Miscellaneous**

Necessary accessories shall be provided wherever necessary for proper operation and shall also include.

- 6.1 PVC eliminator fixed to the spray section to avoid water spillage.
- 6.2 Necessary piping for water circulation.
- 6.3 Vibration isolators for the blowers and pumps.
- 6.4 Canvas connections at the outlet of each fan.
- 6.5 Nuts, bolts, shims etc., as required for the grouting of the equipment.
- 6.6 Float valve in the spray tank, along with quick fill connection.
- 6.7 Gate valves in drain; make up, quick fill line etc, as required.
- 6.8 Built in isolator switches for the fan and pump motor and wiring from the isolators up to the respective motors.

7. **Limitation**

- 7.1 The air velocity limits are as follows:-
  - 7.1.1 Velocity across scrubber not exceeding 2.54 M/s (500 FPM).
  - 7.1.2 Velocity at blower outlet-not exceeding 10.16 M/s (2000) FPM.

## **ULTRAVIOLET GERMICIDAL IRRADIATION (UVGI) SYSTEM FOR AHU COOLING COIL**

### **PART-1 GENERAL**

- 1.1 UVGI System shall be provided with the primary aim of achieving substantial reduction in bacteria count, both airborne and on cooling coil surface. The UVGI System shall preferably be 100% indigenous to ensure following:
  - a. Cost effective approach
  - b. Easy availability of replacement lamps and other parts
- 1.2 Selection Criteria / Basis of Design:
  - a. The UVGI system shall be designed to cover the entire face area of the cooling coil
  - b. The face velocity of dehumidified air over the coil will be 500 FPM or lower.
  - c. The UVGI system shall achieve near total elimination of bacteria/biomass on the cooling coil. Subsequently, the UVGI system will be kept in on position 24/7 (even when the AHU is switched off or is not in operation) to ensure that the bacteria does not reappear.
2. **QUALITY ASSURANCE:**

UL Compliance: Comply with UL Standard 1995( LATEST) as applicable to usage of UVGI system in HVAC Equipment.
3. **DELIVERY, STORAGE AND HANDLING:**
  - a) Store UVGI System in a clean dry place and protect from weather and construction traffic. Handle the system carefully to avoid damage to components, enclosures and finish. Do not install damaged components; replace and return damaged components to equipment manufacturer.
  - b) Comply with manufacturer's installation instructions placement, wiring and testing.

### **PART 2 – PRODUCTS**

#### **1. UVGI SYSTEM**

##### **A. GENERAL**

1. **Acceptable Manufacturers:** As specified in the approved make list.
  - a. Double ended medium bi-pin lamps as shown on Schedule or Drawings.
  - b. Independent lab's certificate for wavelength and reflectance shall be submitted.
2. **Quality Assurance:**

- a. Qualifications: Each component and product is to be inbound and outbound tested before shipment under Mil Standard 105E and ANSI/ASQCZ 1.4.
  - b. Output Verification: When tested in accordance with the general provisions of IES Lighting Handbook, 1981 Applications Volume, total output per one inch arc length shall not be less than 10  $\mu\text{W}/\text{cm}^2$ , at one meter.
3. Warranty:
- a. Fixture and the system shall be warranted to be free from defects for a period of one year.

## B. DESIGN REQUIREMENTS

1. Irradiation – The UVGI system and fixtures are to be installed in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan. To maintain energy efficiency, the UVC energy produced shall be of the lowest possible reflected and shadowed losses.
2. Intensity – Shall be measured by a Solid State Photodiode UV Sensor at the coil. Calibration wavelength is 254 nm. Accuracy is to be  $\pm 10\%$  and be NIST traceable. Read by a Display module with a 3.5 digit LCD screen/panel. Irradiance range shall preferably be 0-1999  $\mu\text{W}/\text{cm}^2$  with a resolution of 10 $\mu\text{W}/\text{cm}^2$ . This shall not be part of the system but only a measurement tool.
3. Installation – UVGI system and fixtures shall be installed downstream of the cooling coil at right angles to the coil fins, such that UVC energy bathes all surfaces of the coil and drain pan. The internal wiring for UV system shall be supplied by manufacturer/strategic business partner/ authorized dealers of manufacturer business partners only.

## C. EQUIPMENT

1. Units shall be high output, HVAC-type, germicidal UVC light sources, factory assembled and tested. Components shall include a housing, high efficiency electronic power source, sockets and lamps, all constructed to withstand HVAC environments.
2. Housings shall be made of robust materials, with Units having electrical connectors on both ends to simplify gang wiring and wiring to power.
3. Reflectors shall be constructed of high spectral finished aluminum alloy with a minimum 85% reflectance of 254-nm UVC energy.
4. High efficiency electronic power sources shall be 115 or 208/230V AC. They shall be UL listed to comply with UL Standard 1995 and capable of igniting each Lamp at temperatures from 35-165 °F. They shall be equipped with RF and line noise suppression.
5. UV lamp shall be fabricated out of Quartz Glass and of the high output, hot cathode, T5 (15mm) diameter, and medium bi-pin type. They shall produce 95% of their energy at 254 nm. UVGI system shall not produce ozone or other

secondary contamination. The lamp shall be high output type and should not be lower than 800 mA.

6. The UV lamps should be made in India for ease of spares availability and faster deliveries. The contractor shall specify the make and origin of the UVGI system being offered.
7. Output verification shall be carried out in accordance with the general provisions of IES lighting handbook, 1981 application volume, total output per one inch are length shall not be less than  $10 \mu\text{W}/\text{cm}^2$ , at one meter.
8. The UVGI System and fixtures are to be installed in quantity mentioned as per BOQ and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan and to maintain energy efficient UVC energy produced shall be of the lowest possible reflected and shadowed losses.
9. The system shall have a separate IP-54 Control Panel consisting of:
  - a. Electronic Ballast
  - b. Run hour meter
  - c. Mains on indicator lamp
  - d. MCB
10. The Life of lamp shall be 9000 hours after which it shall be replaced.
11. The Lamp construction should include “Getter” in order to provide continuous filtration of any impurities throughout the life cycle of lamp.
12. The Lamp shall be tested by an approved Indian Lab for output performance of 254 nm.

### PART 3 – INSTALLATION

#### 1. INSTALLATION OF UVGI SYSTEM

- A. Coordinate with installation of HVAC equipment and install the UVGI system as indicated after such equipment is properly installed.
- B. HVAC contractor/AHU manufacturer shall provide an interlock switch, if required, on the access to the UVGI system to turn the lights off when the access is opened.
- C. Install provided Caution Labels on appropriate location.

#### 2. COMMISSINING AND TRAINING:

The system shall be commissioned by the Supplier’s personnel authorized by the manufacturer. The client’s operator/engineer shall be trained in the operation and routine maintenance for a period of at least one working day.

#### 3. SPARES:

The Supplier shall confirm that sufficient stock of spares is held by them to ensure

trouble free and continuous operation of the system and particularly the lamps shall be kept at a place from where it can be made available at site within 36hrs. While submitting the bid, the price for spare lamps for one more additional year beyond warranty, shall also be submitted by the contractor.

4. MANPOWER DEPLOYMENT:

- i. The contractor shall deploy the manpower in consultation with Engineer in-charge and carry out the activities in hygienic manner.
- ii. The manpower can also be deployed during OFF days/holidays/night hours as per site requirements.

## **CONTROLS**

### **1. SCOPE**

This chapter covers the requirements of equipment safety controls, refrigerant flow controls and system controls.

**AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 12.**



## **ELECTRICAL WORKS**

### **1. SCOPE**

This chapter covers the requirements of equipment safety controls, refrigerant flow controls and system controls.

**AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 13.**

## **DUCTING**

This chapter covers the general requirements for sheet metal ductwork for air distribution with associated items such as air outlets and inlets, fresh air intake and fire dampers.

**AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 9.**

## **WATER PLUMBING WORK**

### **SCOPE**

This chapter covers the requirements of plumbing work in chilled water, hot water, water in condenser circuit and drains, to be executed as part of heating, ventilating and air conditioning.

**AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 10.**

## **INSULATION**

### **SCOPE**

This chapter covers the requirements of thermal insulation for chilled water / hot water piping, pumps and tanks, duct work ,and acoustic lining in duct work and weather maker rooms. This does not cover exposed roof insulation and under deck insulation work.

**AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 11.**

## **INSPECTION, TESTING AND COMMISSIONING**

This chapter covers initial inspection and testing of compressor, condenser, chiller & AHUs at manufacturer's works, initial inspection of other equipments/ materials on receipt at site, final inspection testing & commissioning of all equipment at site & description of testing requirements & procedure.

**AS PER CPWD "GENERAL SPECIFICATIONS FOR HVAC WORKS 2017" CHAPTER 17.**

## **MODE OF MEASUREMENTS**

### **1. Unit Prices in the Schedule of Quantities:**

- 1.1 The item description in the schedule of quantities is in the form of a condensed resume. The unit price shall be held to include every thing necessary to complete the work covered by this item in accordance with the specifications and drawings. The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.
- 1.2 The unit price of the various items shall include the following:
  - 1.2.1 All equipment, machinery, apparatus and materials required as well as the cost of any tests which the consultant may request in addition to the tests generally required to prove quality and performance of equipment.
  - 1.2.2 All the labour required to supply and install the complete installation in accordance with the specifications.
  - 1.2.3 Use of any tools, equipment, machinery, lifting tackle, scaffolding, ladders etc. Required by the contractor to carry out his work.
  - 1.2.4 All the necessary measures to prevent the transmission of vibration.
  - 1.2.5 The necessary material to isolate equipment foundations from the building structure, wherever necessary.
  - 1.2.6 Storage and insurance of all equipment apparatus and materials.
- 1.3 The contractor's unit price shall include all equipment, apparatus, material and labour indicated in the drawings and/or specifications in conjunction with the item in question, as well as all additional equipment, apparatus, material and labour usual and necessary to make in question on its own (and within the system as a whole) complete even though not specifically shown, described or otherwise referred to.

### **2. Measurements of Sheet Metal Ducts, Grilles/Diffusers etc.**

#### **2.1 Sheet Metal Ducts**

- 2.1.1 All duct measurements shall be taken as per actual outer duct surface area including bends, tees, reducers, collars, vanes & other fittings. Gaskets, nuts, bolts, vibration rotation pads are included in the basic duct items of the boq.
- 2.1.2 The unit of measurements shall be the finished sheet metal surface area in metres squares. No extra shall be allowed for lapse and wastages.
- 2.1.3 All the guide vanes, deflectors in duct elbows, branches, grille collars quadrant

dampers etc. shall be measured for actual sheet metal surface and paid for at the same rate as duct of same thickness.

- 2.1.4 The unit duct price shall include all the duct hangers and supports, exposing of concrete reinforcement for supports and making good of the same as well as any materials and labour required to complete the duct frame.

## 2.2 **Grilles/Diffusers**

All grilles/diffusers as per tender requirements shall be treated as a lump sum item. Where extra grilles diffusers are ordered upto award of work, they should be measured as follows:

- 2.2.1 All measurements of grilles/diffusers shall be the actual neck size excluding the outer flanges.
- 2.2.2 The square or rectangular grilles/diffusers shall be measured in plain sq.m.
- 2.2.3 All round diffusers shall be measured by their diameters in cm.
- 2.2.4 All linear diffusers shall be measured as per actual length in metres.

## 3. **Measurements of Piping, Fittings, Valves, Fabricated Items :**

### 3.1 **Pipe**

Including water piping, steam piping and all other piping required to be executed at site for completion of the works.

- 3.1.1 All pipes shall be measured in linear metre (to the nearest cm) along the axis of the pipes and rates shall be inclusive of all fittings e.g. tees, bends, reducers, elbows etc. deduction shall be made for valves in the line.
- 3.1.2 Exposing reinforcement in wall and ceiling and floors of possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and schedule of quantities.
- 3.1.3 Rates quoted shall be inclusive of providing and fixing vibration pads and wooden pieces, wherever specified or required by the project co-ordinator.
- 3.1.4 Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.
- 3.1.5 The length of the pipe for the purpose of payment will be taken through the centreline of the pipe and all fittings (e.g. tees, bends, reducers, elbows, etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges, section 3.2 below applies.

### 3.2 **Valves and Flanges**

- 3.2.1 All the extra ci & cm flanged valves shall be measured according to the nominal size in mm and shall be measured by number. Such valves shall not be counted as part of pipe length hence deduction in pipe length will be made wherever valves occur.
- 3.2.2 All gun metal (gate & globe) valves shall include two Nos. of flanges and two numbers 150 mm long ms nipples, with one side threaded matching one of the valves, and other welded to the M.S. slip-on-flange. Rate shall also include the necessary number of bolts, nuts and washers, 3 mm thick insertion gasket of required temp, grade and all items specified in the specifications.
- 3.2.3 The rates quoted shall be inclusive of making connections to the equipment, tanks, pumps etc. and the connection made with an installed pipe line shall be included in the rates as per the BOQ.

### 3.3 **Structural Supports**

Structural supports including supports fabricated from pipe lengths for pipes shall be measured as part of pipe line and hence no separate payment will be made. Rates shall be inclusive of hoisting, cutting, jointing, welding, cutting of holes and chases in walls, slabs or floors, painting supports and other items as described in specifications, drawings and schedule of quantities or as required at site by project co-ordinator.

### 3.4 **Copper Connections for Fan Coil Units**

- 3.4.1 Copper connection assembly for making connections to the fan coil units shall be measured, as part of the fan coil unit price and shall include brass flare nuts, brass straight connector, brass tees, brass reducing fittings, fixing of automatic 3 way valve, making connections and leak testing, complete assembly as per specifications and drawings. Nothing extra shall be payable on account of any variation in the length of copper pipe.

## 4. **Insulation:**

- 4.1 The measurement for vessels, piping, and ducts shall be made over the bare uninsulated surface area of the metal.

### 4.2 **Pipes, Ducts & Vessels**

#### 4.2.1 **Pipes**

The measurements for installation of piping shall be made in linear metres through all valves, flanges, and fittings. Pipes/bends shall be measured along the centreline radius between tangent points. If the outer radius is  $r_1$  and the inner radius is  $r_2$  the centre line radius shall be measured as  $(r_1+r_2)/2$ . Measurement of all valves, flanges and fittings shall be measured with the running metre of pipe line as if they are also pipe lengths. Nothing extra over the above shall be payable for insulation



over valves, flanges and fittings in pipe line/routings. Fittings that connect two or more different sizes of pipe shall be measured.

#### 4.2.2 **Ducts**

The measurements for insulation of ducts shall be made in actual square metres of bare uninsulated duct surface through all dampers, flanges and fittings. In case of bends the area shall be worked out by taking an average of inner and outer lengths of the bends. Measurements for the dampers, flanges, fittings shall be for the surface dimension for the connecting duct, nothing extra over the above shall be payable for insulation over dampers, flanges and fittings in duct routing.

#### 4.2.3 **Vessels**

The area of standard dished and flat ends of vessels shall be the square of the diameter of the uninsulated body of the shell. Areas for other shapes shall be the actual calculated area. There shall be no deduction or additions for nozzles, handles ribs, dampers, expansion joints etc. All projections on vessels or tanks shall be measured separately as pipe/duct.

#### 4.3 **Accessories Insulation**

4.3.1 The unit of measurement for accessories such as expansion tank, pumps, chiller heads etc. shall be uninsulated are in square metres.

4.3.2 In case of curved or irregular surfaces, measurements shall be taken along the curves.

4.3.3 The unit insulation price shall include all necessary adhesives, vapour proofing and finishing materials as well as additional labour and material required for fixing the insulation.

#### 4.4 **Acoustic Duct Lining**

4.4.1 In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square metres, shall be final for billing purposes.

4.4.2 The insulation/acoustic panels shall include cost of battens, supports, adhesives, vapour proofing, finished tiles/boards/sheets as well as additional labour and materials required for completing the work.

## LIST OF APPROVED MAKES AND MANUFACTURERS

The makes/brands of equipment listed below are approved for installation.

For all items to be used in the work samples, catalogues and specifications are to be submitted by the contractor for approval of the Engineer In charge. Only approved makes shall be used in the works. Equivalent makes may be added with price adjustment with approval of Engineer In charge. The approved samples shall be kept in the custody of the Engineer for comparison.

| S.No | Material/Item  | Approved Makes   |
|------|--|--|
|      | HVAC SUBCONTRACTORS  | VOLTAS/BLUE STAR/ SUVIDHA/ UNIQUE ENGINEERS / ETA/ STERLING & WILSON |
|      | <b>High Side Equipment</b>   |  |
| 1    | Centrifugal Chilling Units with VFD (ARI Certified)                | Carrier/ Trane/ York   |
| 2    | Screw chiller (ARI Certified)                                      | Carrier/Trane/York/Danhum bush                                       |
| 3    | Scroll Chiller /Heat pump  | Carrier/ Trane/ York/ Danhum bush / Mitsubishi                       |
| 4    | Primary Chilled / Condenser water Pumps (End suction back pullout) | Grundfoss/ Armstrong/ wilo   |
| 5    | Pumps Monoblock  | Kirloskar/Beacon/Siemens/KSB/Greaves                                 |
| 6    | Pumps Coupled with VFD   | Grundfoss/ Wilo / Armstrong  |
| 7    | VFD with controls panel  | Grundfoss/ Wilo/ Armstrong   |
| 8    | Cooling Towers (CTI Approved)                                      | Paharpur/Bell/Mihir/Marley/Baltimore                                 |
| 9    | Electric hot water generator                                       | Rapid cool/ Emerald/ Khokhar   |
|      | <b>Air Handling Units</b>  |  |
| 10   | Air Handling Units (High Static) with cooling coils                | Carrier/Caryaire/ZECO/Systemair/Voltas/VTS/ Flaktwood/ Waves/Edgtech |
| 11   | Centrifugal Fan for AHU's  | Nicotra/ Comefri/ Flakt/ Kruger/VTS                                  |
| 12   | VFD for AHU  | Danfoss/ Siemens/ VTS /Allen Bradley/ ABB/ Schneider                 |
| 13   | Ultra Violet Germicidal Irradiation/ PHI                           | Ruks/Trimed/RGF  |
| 14   | Fan Coil Units   | Same as AHU  |
| 15   | Air washer   | Ambassador/Humidin/ Roots Cooling/ Ambiator                          |
| 16   | Scrubber (Wet/Dry)   | Wet : same as AHU, Dry: Espair/Trion/Thermax/ Rydair                 |
| 17   | Humidifier   | Rapid cool/Emerald/Khokar  |
| 18   | Fan section  | Same as AHU  |

|    |  |  |
|----|--|--|
| 19 | Centrifugal /Axial Flow Fans/Tube Axial (AMCA Certified) | Flakt/ Nicotra/ Comefri/ Kruger /Greenheck/System air  |
| 20 | Propeller Fans   | GEC (Alsthom)/ Crompton Greaves/ Khaitan/ Usha   |
| 21 | Precision AC units                                       | Emerson/ Blue box/ Stulz/ Hiross   |
| 22 | Window/split AC  | Hitachi/ Daikin/ O-general   |
| 23 | VRV/VRF  | Hitachi/ Daikin/Toshiba/ Mitsubishi Electric   |
| 24 | Cassette Units-Chilled water based                       | Daikin/ Midea/ Trane   |
| 25 | Inline Fans  | Flakt/Nicotra/Comefri/Kruger/SystemAir/Ostberg/Greenheck   |
| 26 | Heat recovery unit complete with Heat recovery wheel     | Flaktwoods/ Novelaire/ DRI/ Greenheck/ Bryair  |
| 27 | Heat Exchanger   | Heat X/ Mark/ Alfa lavel   |
| 28 | Thermal storage tank                                     | Crystopia/ Dunhambush/ Calmac  |
|    |  |  |
|    | <b>Electrical Equipment</b>                              |  |
| 29 | Main AC Panel  | L&T/ Siemens / ABB/ Schneider  |
| 30 | AHU/ventilation electrical panels                        | Tricolite/ Adlec/ Sterling & Wilson/ C&S/ Jackson Engineers/ Milestone/ Nitya/ SPC/ Risha/ Neptune/ Zeta |
| 31 | Electric Motors  | Siemens/ Kirloskar/ ABB/ Crompton Greaves.   |
| 32 | ACB  | L&T-U power(Omega)/ GE-Entelliguard/ Siemens-3WL/ ABB/ Legrand-DMS/ Schneider-NW master pact             |
| 33 | MCCB   | L&T-(D shine/DL) / GE-Record Plus / Siemens-VA/ ABB-TMA/ Schneider- compact NSX                          |
| 34 | MCB  | L&T/ Legrand-DX3/ Hager / Seimens-VA/ ABB/ MDS Lexic   |
| 35 | PVC Tape   | Steelgrip or equivalent as approved by engineer in-charge.   |
| 36 | Push button starter                                      | L&T/ GE / Siemens/ ABB/ Schneider  |
| 37 | Auxiliary Relays/Contactors                              | L&T/GE/ Siemens/ ABB/ Schneider  |
| 38 | Line Type Fuse   | L&T/GE/ Siemens/ ABB/ Schneider  |
| 39 | Timer  | L&T/GE/ Siemens/ ABB/ Schneider/ Legrand   |
| 40 | Terminal Block   | Elmex or equivalent as approved by engineer in-charge.   |
| 41 | Voltmeter/Ammeter  | L&T/GE/ Siemens/ ABB/ Schneider  |
| 42 | Indicating lamps   | L&T/GE/ Siemens/ ABB/ Schneider  |
| 43 | Selector Switches  | L&T/GE/ Siemens/ ABB/ Schneider  |
| 44 | Change Over Switch                                       | L&T/GE/ Siemens/ ABB/ Schneider  |
| 45 | CT/PT  | L&T/GE/ Siemens/ ABB/ Schneider  |
|    |  |  |
|    | <b>Cables</b>  |  |

|    |  |  |
|----|--|--|
| 46 | Power Cables / Control Cables            | CCI/ Universal/ Finolex / Rallison                               |
| 47 | Cable tray                               | OBO/ Legrand/ Cooper/ BEC  |
| 48 | Cable lugs                               | Dowells/ Comet   |
|    | <b>Dcting</b>                            |  |
| 49 | Factory fabricated duct                  | Ductofab/ Rolastar/ Technofab                                    |
| 50 | G.I. Sheet                               | TATA/ SAIL/ Jindal   |
| 51 | Spiral duct / Flexible duct              | Atco/ Seven Star/ Caryaire                                       |
| 52 | Grilles/Diffusers/Volume Control damper  | Ravistar/ Caryaire/ Mapro  |
| 53 | Fire Dampers UL listed                   | Caryaire/ Ravistar/ Ruskin                                       |
| 54 | Sound Attenuator                         | Caryaire/ Ravistar/Trox  |
| 55 | Aluminium Sheets                         | Balco/ Nalco/ Hindalco   |
|    | <b>Pipes</b>                             |  |
| 56 | G.I.                                     | Jindal Hissar/ Tata/ SAIL  |
| 57 | M.S. upto 150 mm                         | Jindal Hissar/ Tata/ SAIL  |
| 58 | M.S. 200 mm and above dia factory rolled | Jindal Hissar/ Tata/ SAIL  |
|    |  |  |
|    | <b>Valves</b>                            |  |
| 59 | Butterfly Valves                         | Audco/ L&T/ Honeywell  |
| 60 | Motorised butterfly valve(actuator)      | Belimo/ Honeywell/ Siemens                                       |
| 61 | Non Return Valve                         | Advance/ Kirloskar/ Audco  |
| 62 | Balancing Valves                         | Advance/ Audco/ Danfoss/ Honeywell/L&T                           |
| 63 | Gate/Globe Valves                        | Leader/ Divine/ Sant/ Bankim Sarkar / Zoloto                     |
| 64 | GM valve upto 40mm                       | Leader/ Divine/ Sant/ Bankim Sarkar /Zoloto                      |
| 65 | Ball Valve with Y strainer               | Rapid Control/ Sant/ Leader/ Zoloto                              |
| 66 | Pressure independent Balancing valve     | Danfoss/ Flowcon/ TA   |
|    | <b>Accessories</b>                       |  |
| 67 | Pot & Y-strainer                         | Emerald/ Sant/ Rapid cool  |
| 68 | Pressure Gauge                           | Fiebig/ Emerald/ H Guru  |
| 69 | Thermometer                              | Fiebig/ Emerald/ H Guru  |
| 70 | Flow Switch                              | Rapid Control/ Anergy  |
| 71 | Automatic Air Vent                       | Rapid Control/ Anergy  |
| 72 | Suction Guide                            | Anergy/ Rapid Control/ Flowcon                                   |
| 73 | Filters (pre,fine Hepa)                  | Thermadyne/ Spectrum/ Kirloskar /Anfilco/ Johnflower/ Dynafilter |
|    | <b>Insulation</b>                        |  |

|     |  |   |
|-----|--|---|
| 74  | Expanded Polystyrene   | Beardsell Ltd./ BASF / Lloyd/ Styrene packaging       |
| 75  | Glass Wool   | FGP Ltd./UP Twiga/ Kimmco                             |
| 76  | Polyurethane Foam  | Malanpur /Superurethane                               |
| 77  | Crossed linked Polyethylene Foam                             | Trocellene / Superlon                                 |
| 78  | Closed Cell Elastomeric Insulation                           | K-flex /Vidoflex/ Armacell/ Aeroflex                  |
| 79  | Non woven fibre material                                     | Mikron/ Du pont                                       |
| 80  | Mineral wool   | Rockwool India Pvt Ltd/ Lloyd                         |
| 81  | Pre-moulded PUF section for pipe & pipe supports             | Malanpur/ Lloyd                                       |
| 82  | Fibreglass rigid Board/ Pipe section                         | FGP Ltd./ UP Twiga/ Kimmco                            |
| 83  | Aluminium Tape   | Johnson/ Birla 3M/ Garware                            |
| 84  | Closed Expansion tank with built in degaser / dirt separator | Flamco/ reflex / Spirotech                            |
| 85  | Bellows  | Dunlop/ Kanwal/ Resistoflex                           |
| 86  | 2/3-Way motorized valve for AHU/FCU                          | Johnson control/ Danfoss/ Siemens/ Belimo             |
| 87  | Thermostats  | Honeywell/ Johnson controls/ Belimo/ Danfoss/ Siemens |
| 88  | Humidistat   | Honeywell/ Johnson control/ Belimo/ Danfoss /Siemens  |
| 89  | Electric Strip Heaters                                       | Escorts/ Daspas                                       |
| 90  | Safety Thermostat for Heaters                                | Honeywell/ Siemens/ Danfoss/ Belimo /Siemens          |
| 91  | Cooling/heating Mode Changer                                 | Honeywell/ Siemens/ Danfoss/ Belimo/ Siemens          |
|     | <b>Paints</b>  |   |
| 92  | Enamel   | ICI/ Asian/ Nerolac/ Berger                           |
| 93  | Bituminus  | Indian Oil / HP                                       |
| 94  | Tarfelt ( for underground chilled water pipe insulation)     | Indian Oil / HP                                       |
| 95  | IBMS Approved vendor   | Siemens/ Honeywell/ Johnson controls/ ABB/Schneider   |
| 96  | DDC Controllers  | Siemens/ Honeywell/ Johnson controls/ ABB/Schneider   |
| 97  | Sensors(Pressure/Temperature)                                | Siemens/ Honeywell/ Johnson controls/ ABB/Schneider   |
| 98  | VAV/ CAV   | Trane/ Trox/ Johnson Controls                         |
| 99  | Airflow Switch (Air & water)                                 | Johnson control/ Honeywell/ Siemens                   |
|     | <b>Miscellaneous</b>   |   |
| 100 | V Belt   | Dunlop/ Fenner  |

|     |                            |                             |
|-----|----------------------------|-----------------------------|
| 101 | Anchor fasteners           | Fischer/ Hilti              |
| 102 | Dash fastener              | Fischer/ Hilti              |
| 103 | Welding rods               | Advani/ L&T                 |
| 104 | Flexible pipe connection   | Dunlop/ Kanwal/ Resistoflex |
| 105 | Hessian Cloth (fire rated) | Navair/ Pyrogaurd           |
| 106 | Vibration isolator         | Resistoflex/ Dunlop/ Kanwal |
| 107 | Air Ozone                  | Ruks/ Trimed/ RGF           |
| 108 | Fire Sealant               | Birla 3M/ Hilti/ Promat     |
| 109 | Adhesive / UV coating      | Pidilite / Star bond        |

**HSCC (India) Limited  
as Executing Agency on behalf of  
MINISTRY OF HEALTH & FAMILY WELFARE,  
NEW DELHI**

**TENDER**

**FOR  
Construction of Hospital and Academic  
Campus  
at  
All India Institute of Medical Sciences  
Mangalagiri Distt. Guntur (AP)**

**under**

**Pradhan Mantri Swasthya Suraksha Yojana  
(PMSSY)**

**VOLUME – V**

**Bill of Quantities(BOQ)**

**JANUARY 2018**

**Executing Agency**



**HSCC (INDIA) LTD.**

**E-6(A), sector-1, NOIDA(U.P) 201301 (India)**

**Phone : 0120-2542436-40**

**Fax : 0120-2542447**

**Tender No. HSCC/PMSSY/AIIMS/Guntur/H&A/2018**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

**MAIN ABSTRACT SHEET**

| <b>A</b>     | <b>CIVIL WORKS</b>                             |                         |                         |
|--------------|--|-------------------------|-------------------------|
| <b>S. No</b> | <b>SUB - HEADS</b>                             | <b>DSR AMOUNT</b>       | <b>NSR AMOUNT</b>       |
| 1.0          | Earth Work                                     | 105,703,133.50          | -                       |
| 2.0          | Concrete Work                                  | 50,038,090.15           | -                       |
| 3.0          | Reinforced Cement Concrete                     | 1,268,904,128.40        | 98,848,540.00           |
| 4.0          | Brick Work                                     | 189,329,075.25          | 18,248,916.00           |
| 5.0          | Stone Work                                     | 4,244,244.00            | -                       |
| 6.0          | Marble and Granite Works                       | 153,423,527.45          | -                       |
| 7.0          | Wood and PVC Works                             | 89,304,348.45           | 74,447,075.00           |
| 8.0          | Steel Work                                     | 23,102,307.50           | -                       |
| 9.0          | Flooring Works                                 | 142,781,460.10          | 10,407,104.00           |
| 10.0         | Acoustical Works                               | -                       | 42,887,741.19           |
| 11.0         | Roofing Works                                  | 144,344,953.95          | 7,868,300.00            |
| 12.0         | Finishing                                      | 144,525,747.50          | 1,895,400.00            |
| 13.0         | Waterproofing                                  | 73,492,711.05           | 14,650,207.00           |
| 14.0         | Aluminium, Structural Glazing and Facade Works | 350,984,406.20          | 402,203,054.00          |
| 15.0         | Roads  | 257,469,643.00          | -                       |
| 16.0         | Horticulture                                   | 15,102,005.75           | 6,888,960.00            |
| 17.0         | Signages                                       | -                       | 21,189,117.35           |
|              | <b>TOTAL</b>                                   | <b>3,012,749,782.25</b> | <b>699,534,414.54</b>   |
|              |  |                         |                         |
|              | <b>TOTAL</b>                                   |                         | <b>3,712,284,196.79</b> |
|              |  |                         |                         |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No    | Item Description  | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|------------|------------|---|---------|------|----------|----------|------------------|------------------|
| 1          | 1A         | 2   | 3       | 4    | 5        | 6        | 7                | 8                |
| <b>1.0</b> | <b>2.0</b> | <b>EARTH WORK</b>   |         |      |          |          |                  |                  |
| 1.1        |            | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead upto 500m and lift upto 1.5m, as directed by Engineer in charge.   |         |      |          |          |                  |                  |
| 1.1.1      | 2.6.1      | All kinds of soil   | 188,680 | Cum  | 125.95   |          | 23,764,246.00    | -                |
| 1.2        |            | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth, 1.5m in width as well as 10 sqm on plan) including disposal of excavated earth, lead upto 500m and lift upto 1.5m, as directed by Engineer in charge.  |         |      |          |          |                  |                  |
| 1.2.1      | 2.7.1      | Ordinary rock   | 55,121  | Cum  | 221.05   |          | 12,184,497.05    | -                |
| 1.2.2      | 2.7.3      | Hard rock (blasting prohibited)   | 17,767  | Cum  | 619.80   |          | 11,011,986.60    | -                |
| 1.3        |            | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 500m. |         |      |          |          |                  |                  |
| 1.3.1      | 2.8.1      | All kinds of soil   | 10,882  | Cum  | 166.40   |          | 1,810,764.80     | -                |
| 1.4        |            | Excavation work by mechanical means (Hydraulic excavator)/ manual means in foundation trenches or drains (not exceeding 1.5m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soils as directed, within a lead of 500m.         |         |      |          |          |                  |                  |
| 1.4.1      | 2.9.1      | Ordinary rock   | 3,109   | Cum  | 275.85   |          | 857,617.65       | -                |
| 1.4.2      | 2.9.3      | Hard rock (blasting prohibited)   | 1,554   | Cum  | 656.70   |          | 1,020,511.80     | -                |
| 1.5        | 2.25       | Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 500m and lift upto 1.5m.  | 176,881 | Cum  | 125.75   |          | 22,242,785.75    | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No    | Item Description   | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items      | Amount NSR Items |
|------------|------------|--|---------|------|----------|----------|-----------------------|------------------|
| 1.6        |            | Extra for every additional lift of 1.5m or part thereof in excavation / banking excavated or stacked materials.  |         |      |          |          |                       |                  |
| 1.6.1      | 2.26.1     | All kinds of soil  | 89,767  | Cum  | 51.75    |          | 4,645,442.25          | -                |
| 1.7        | 2.27       | Supplying and filling in plinth with sand (zone V) under floors, including watering, ramming, consolidating and dressing complete.   | 500     | Cum  | 917.75   |          | 458,875.00            | -                |
| 1.8        | 1.1.1      | Carriage of excavated earth by mechanical Transport including loading - unloading and stacking beyond 500 mtr and up 1km .   | 10,000  | Cum  | 299.00   |          | 2,990,000.00          | -                |
| 1.9        | 2.31       | Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the area cleared. | 327,002 | Cum  | 7.20     |          | 2,354,414.40          | -                |
| 1.10       |            | Supplying and stacking of Good Earth at site inclusive of royalty and carriage (earth measured in stacks will be reduced by 20% for payemnt).  |         |      |          |          |                       |                  |
| 1.10.1     | 16.3.9     | Good Earth   | 67,244  | Cum  | 332.55   |          | 22,361,992.20         | -                |
|            |            | <b>Sub-total (Earth Work)</b>  |         |      |          |          | <b>105,703,133.50</b> | <b>-</b>         |
| <b>2.0</b> | <b>4.0</b> | <b>CONCRETE WORKS</b>  |         |      |          |          |                       |                  |
| 2.1        |            | Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level   |         |      |          |          |                       |                  |
| 2.1.1      | 4.1.3      | 1:2:4 (1 cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 20mm nominal size).  | 38      | Cum  | 5,481.95 |          | 208,314.10            | -                |
| 2.1.2      | 4.1.5      | 1:3:6 (1 Cement : 3 coarse sand (zone-III) : 6 graded stone aggregate 20mm nominal size).  | 133     | Cum  | 4,927.00 |          | 655,291.00            | -                |
| 2.1.3      | 4.1.8      | 1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone aggregate 40mm nominal size)   | 4,065   | Cum  | 4,478.15 |          | 18,203,679.75         | -                |
| 2.1.4      | 4.1.10     | 1:5:10 (1 Cement : 5 coarse sand (zone-III) : 10 graded stone aggregate 40mm nominal size)   | 6,493   | Cum  | 4,209.05 |          | 27,329,361.65         | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No    | Item Description  | Qty     | Unit             | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items |
|------------|------------|---|---------|------------------|----------|----------|----------------------|------------------|
| 2.2        |            | Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor etc., up to floor five level, excluding the cost of centering, shuttering and finishing: |         |                  |          |          |                      |                  |
| 2.2.1      | 4.2.3      | 1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size).  | 155     | Cum              | 6,547.70 |          | 1,014,893.50         | -                |
| 2.3        | 4.10       | Providing and laying damp-proof course 40mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand(zone-III) : 4 graded stone aggregate 20mm nominal size).   | 2,025   | Sqm              | 263.10   |          | 532,777.50           | -                |
| 2.4        | 4.12       | Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification.  | 607     | per 50 kg cement | 47.95    |          | 29,105.65            | -                |
| 2.5        | 4.13       | Providing & applying a coat of residual petroleum bitumen of grade of VG-10 of approved quality using 1.7kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.   | 2,025   | Sqm              | 91.90    |          | 186,097.50           | -                |
| 2.6        | 4.14       | Extra for concrete work in superstructure above floor V level for each four floors or part thereof.   | 2,930   | Cum              | 641.15   |          | 1,878,569.50         | -                |
|            |            | <b>Sub-total (Concrete Work)</b>  |         |                  |          |          | <b>50,038,090.15</b> | <b>-</b>         |
| <b>3.0</b> | <b>5.0</b> | <b>REINFORCEMENT CONCRETE WORKS</b>   |         |                  |          |          |                      |                  |
| 3.1        |            | Centering and shuttering including strutting, propping etc. and removal of form for :   |         |                  |          |          |                      |                  |
| 3.1.1      | 5.9.1      | Foundations, footings, bases of columns, etc. for mass concrete   | 11,892  | Sqm              | 193.95   |          | 2,306,453.40         | -                |
| 3.1.2      | 5.9.2      | Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.  | 58,762  | Sqm              | 378.60   |          | 22,247,293.20        | -                |
| 3.1.3      | 5.9.3      | Suspended floors, roofs, landings, balconies and access platform  | 101,852 | Sqm              | 422.30   |          | 43,012,099.60        | -                |
| 3.1.4      | 5.9.4      | Shelves (Cast in situ)  | 850     | Sqm              | 422.30   |          | 358,955.00           | -                |
| 3.1.5      | 5.9.5      | Lintels, beams, plinth beams, girders, bressumers and cantilevers   | 60,581  | Sqm              | 342.90   |          | 20,773,224.90        | -                |
| 3.1.6      | 5.9.6      | Columns, Pillars, Piers, Abutments, Posts and Struts.   | 36,769  | Sqm              | 467.85   |          | 17,202,376.65        | -                |
| 3.1.7      | 5.9.7      | Stairs, (excluding landings) except spiral-staircases   | 4,591   | Sqm              | 419.35   |          | 1,925,235.85         | -                |
| 3.1.8      | 5.9.14     | Extra for Shuttering in circular work   | 170     | Sqm              | 93.57    |          | 15,906.90            | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No  | Item Description   | Qty       | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|----------|--|-----------|-------|----------|----------|------------------|------------------|
| 3.1.9    | 5.9.13   | Vertical and horizontal fins individually or forming box louvers band, fascias and eaves boards  | 100       | Sqm   | 627.85   |          | 62,785.00        | -                |
| 3.1.10   |          | Edges of slabs and breaks in floors and walls  |           |       |          |          |                  |                  |
| 3.1.10.1 | 5.9.16.1 | Under 20 cm wide   | 1,080     | Metre | 122.20   |          | 131,976.00       | -                |
| 3.1.10.2 | 5.9.16.2 | Above 20 cm wide   | 200       | Sqm   | 531.10   |          | 106,220.00       | -                |
| 3.1.11   | 5.9.19   | Weather shade, Chajjas, corbels etc., including edges  | 150       | Sqm   | 521.75   |          | 78,262.50        | -                |
| 3.2      |          | Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of de-shuttering and decentering at all levels, over a height of 3.5m, for every additional height of 1 metre or part thereof,<br>(Plan area to be measured)  |           |       |          |          |                  |                  |
| 3.2.1    | 5.11.1   | Suspended floors, roofs, landing, beams and balconies<br>(Plan area to be measured)  | 127,939   | Sqm   | 171.50   |          | 21,941,538.50    | -                |
| 3.3      |          | Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete at all level.  |           |       |          |          |                  |                  |
| 3.3.1    | 5.22.6   | Thermo-Mechanically Treated bars of grade Fe-500 D or more.  | 9,744,186 | Kgs   | 56.60    |          | 551,520,927.60   | -                |
| 3.4      |          | Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.<br>"(Note:- Cement content considered in this item is @ 330kg/cum."Excess / less cement used as per design mix is payable / recoverable separately). |           |       |          |          |                  |                  |
| 3.4.1    | 5.33.1   | All works upto plinth level  | 24,467    | Cum   | 6,446.45 |          | 157,725,292.15   | -                |
| 3.4.2    | 5.33.2   | All works above plinth level up to floor V level.  | 51,599    | Cum   | 7,250.05 |          | 374,095,329.95   | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No      | Item Description  | Qty    | Unit    | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|--------------|---|--------|---------|----------|----------|------------------|------------------|
| 3.5   |              | Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using fly ash and cement content as per approved design mix, and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering, finishing and reinforcement, including cost of admixtures in recommended proportions as per IS : 9103 to accelerate / retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge.<br>NOTE- (1) Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/ recoverable separately." (2) Fly ash conforming to grade I of IS 3812 (Part-1) only be used as part replacement of OPC as per IS : 456. Uniform blending with cement to be ensured in accordance with clauses 5.2 and 5.2.1 of IS:456 - 2000 in the items of BMC and RMC. |        |         |          |          |                  |                  |
| 3.5.1 | 5.40.1       | All works upto plinth level   | 3,486  | Cum     | 6,691.85 |          | 23,327,789.10    | -                |
| 3.5.2 | 5.40.2       | All works above plinth level up to floor V level.   | 572    | Cum     | 7,495.40 |          | 4,287,368.80     | -                |
| 3.6   |              | Extra for providing richer mixes at all floor levels.<br>Note:- Excess/less cement over the specified cement content used is payable /recoverable separately.   |        |         |          |          |                  |                  |
| 3.6.1 | 5.34.1       | Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @340 kg/m3).  | 22,373 | Cum     | 69.50    |          | 1,554,923.50     | -                |
| 3.6.2 | 5.34.3       | Providing M-40 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-40 is @360 kg/m3).  | 41,088 | Cum     | 208.45   |          | 8,564,793.60     | -                |
| 3.6.3 | Based on DSR | Providing M-50 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-50 is @380 kg/m3).  | 7,408  | Cum     | 347.40   |          | 2,573,539.20     | -                |
| 3.7   | 5.35         | Add for using extra cement in the items of design mix over and above the specified cement content therein.  | 15,213 | quintal | 672.75   |          | 10,234,545.75    | -                |
| 3.8   | 5.38         | Extra for R.M.C. work above floor V level for each four floors or part thereof.   | 6,379  | Cum     | 232.30   |          | 1,481,841.70     | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description  | Qty | Unit  | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|-------|----------|------------|------------------|------------------|
| 3.9    | NSR     | Designing, preparation of shop drawings and execution of Post Tensioning work, grouting high tensile steel reinforcement strands including all accessories complete in all respect 5-5 and 5-4 or as per design tendon units comprising 13 mm diameter, class 2 conforming to IS: 14268:1995 low relaxation strands with a tensile strength of 1860 N/mm <sup>2</sup> .<br>Providing and Laying Corrugated flat duct of size 75mm x 20mm or as per design<br>Providing and fixing Stressing /Dead anchorage suitable for 5-5 and 5-4 or as per design tendons including Stressing of Tendons  |     |       |          |            |                  |                  |
|        |         | Note: The Rate shall also include for designing of Post tensioned steel, bursting reinforcement, pressure plates, any additional bars around anchorages, recess formers, spacers, cement grout with admixture marking with paint and epoxy grout. The weight of strands provided shall be measured for payment.   | 574 | Tonne |          | 172,210.00 | -                | 98,848,540.00    |
| 3.10   |         | Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-In-Charge. The joints system will be of extruded aluminum base members, self aligning / self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various vertical locations in load application areas that accommodates multi directional seismic movement without stress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. The Self - centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of Moisture Barrier Membrane in the Joint System to have watertight joint is mandatory requirement all as per the manufactures design and as approved by Engineer -in- Charge. (Material shall conform to ASTM 6063). |     |       |          |            |                  |                  |
| 3.10.1 | 5.44.1  | Floor Joint of 100mm gap  | 207 | Rmt   | 4,741.05 |            | 981,397.35       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No    | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items        | Amount NSR Items     |
|------------|------------|--|-----|------|----------|----------|-------------------------|----------------------|
| 3.11       |            | Providing and fixing of expansion joint system related with wall joint (internal / external) location as per drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221-02. The material shall be such that it provides an Expansion Joints System suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office Buildings & complexes with no slipping down tendency amongst the components of the Joint System. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multicellular to facilitate movement. (Material shall conform to ASTM 6063.)   |     |      |          |          |                         |                      |
| 3.11.1     | 5.45.1     | Wall Joint of 100mm gap  | 378 | Rmt  | 3,928.00 |          | 1,484,784.00            | -                    |
| 3.12       |            | Providing and fixing of expansion joint system of approved make and manufacture for various roof locations as per approved drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members with, self aligning and self centering arrangement support plates as per ASTM B221-02. The system shall be such that it provides water tight roof to roof / roof to corner joint cover expansion control system that is capable of accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. The Self centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. The Joint System shall resists damage or deterioration from the impact of falling ice, exposure to UV, airborne contaminants and occasional foot traffic from maintenance personnel. Provision of Moisture Barrier Membrane in the Joint System to have water tight joint is mandatory requirement. (Material shall confirm to ASTM 6063.) |     |      |          |          |                         |                      |
| 3.12.1     | 5.46.1     | Roof Joint of 100mm gap  | 207 | Rmt  | 4,392.60 |          | 909,268.20              | -                    |
|            |            | <b>Sub-total (Reinforcement Concerete Work)</b>  |     |      |          |          | <b>1,268,904,128.40</b> | <b>98,848,540.00</b> |
| <b>4.0</b> | <b>6.0</b> | <b>BRICK WORK</b>  |     |      |          |          |                         |                      |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|--------|------|----------|----------|------------------|------------------|
| 4.1   | 6.38    | Providing and laying Autoclaved Aerated Cement blocks masonry with 100mm thick AAC blocks in super structure above plinth level up to floor V level in cement mortar 1:4 (1 cement : 4 coarse sand). The rate includes providing and placing in position 2 Nos 6 mm dia M.S. bars at every third course of masonry work.  | 2,110  | Cum  | 6,818.60 |          | 14,387,246.00    | -                |
| 4.2   | 6.47    | Providing and laying Autoclaved Aerated Cement blocks masonry with 150mm / 200mm / 230mm / 300mm thick AAC blocks in super structure above plinth level up to floor V level with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar all complete as per direction of Engineerin-Charge.<br>(The payment of RCC band and reinforcement shall be made for seperately)  | 27,917 | Cum  | 5,687.10 |          | 158,766,770.70   | -                |
| 4.3   | 6.5     | Extra for AAC block masonry in superstructure above floor V level, for each four floors or part thereof by mechanical means.  | 3,719  | Cum  | 205.45   |          | 764,068.55       | -                |
| 4.4   | NSR     | Providing & fixing of Classique Invincible or equivalent Toilet Cubicle of approved make of sizes as per drawing which includes 600 mm door size width made of heat, bacteria, water, chemical ,scratch, impact and anti bacterial resistant 12 mm thick solid compact laminate panels (tested by Shriram Test House or equivalent approved laboratory). Finish of the compact laminate should be Suede/*Raw Silk or as approved by the engineer in charge, which includes door, pilasters & intermediate panels finished with approved texture/shade as per the details drawings & as per IS 2046 (Indian Standard ) and as per fire retardant BS-476/97 Standard. | 2,441  | Sqm  |          | 7,476.00 | -                | 18,248,916.00    |
|       |         | The item also includes providing and fixing in position necessary hardware made out of Stainless steel (Grade 304) as per manufacturer's specification & as approved by the Architect/ Engineer, like (1) Door Knop, (2) Gravity Hinges, (3) Thumb turn lockset indicators, (4) Coat hooks, (5) U- Channels, (6) SS-Shoe Box Plate (7) MS- Base Plate, (8) Top rail with Corner connector (9) Rubber noise deafening tape (10) Screw & wall Plugs etc all complete to the satisfaction of engineer in charge.   |        |      |          |          |                  |                  |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No        | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|----------------|---|-------|------|----------|----------|------------------|------------------|
|       |                | The top fitting should consist of SS round top rail which will get fixed with pilasters,with SS panel tube holder, SS corner bend (connected with top rail) will be used on the corner of cubicle in absence of brickwall, SS wall fixing is used on the wall which will hold the SS top rail. All screws will be of 304 Grade stainless steel with satin finish. All pilasters are supported by stainless steel bottom cladding.The base of stainless steel botoom cladding will be anchored to floor with a clearance height upto 110 mm. (Surface area of partitions including door shall be measured for payment. The quoted rate should be for the complete item and nothing extra is payable in this account. |       |      |          |          |                  |                  |
| 4.5   |                | Brick work with non modular fly ash bricks conforming to IS:12894, class designation 10 average compressive strength:   |       |      |          |          |                  |                  |
| 4.5.1 | 6.34.2         | in super structure above plinth level up to floor V level I Cement mortar 1:6 (1 cement : 6 Coarse sand)  | 100   | Cum  | 6,167.20 |          | 616,720.00       | -                |
| 4.5.2 | Based on 6.2.2 | In Foundations and Plinth: Cement mortar 1:6 (1 cement : 6 coarse sand)   | 2,405 | Cum  | 5,498.00 |          | 13,222,690.00    | -                |
|       |                |   |       |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No    | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items      | Amount NSR Items     |
|------------|------------|---|-------|------|----------|----------|-----------------------|----------------------|
| 4.6        |            | Providing and fixing partition upto ceiling height consisting of G.I. frame and required board, including providing and fixing of frame work made of special section power pressed/ roll form G.I. sheet with zinc coating of 120gms/sqm (both side inclusive), consisting of floor and ceiling channel 50mm wide having equal flanges of 32 mm and 0.50 mm thick, fixed to the floor and ceiling at the spacing of 610 mm centre to centre with dash fastener of 12.5 mm dia meter 50 mm length or suitable anchor fastener or metal screws with nylon plugs and the studs 48 mm wide having one flange of 34 mm and other flange 36 mm and 0.50 mm thick fixed vertically within flanges of floor and ceiling channel and placed at a spacing of 610 mm centre to centre by 6mm dia bolts and nuts, including fixing of studs along both ends of partition fixed flush to wall with suitable anchor fastener or metal screws with nylon plugs at spacing of 450 mm centre to centre, and fixing of boards to both side of frame work by 25 mm long dry wall screws on studs, floor and ceiling channels at the spacing of 300mm centre to centre. The boards are to be fixed to the frame work with joints staggered to avoid through cracks, M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5mm each) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corners (25 mm x 25 mm x 0.5 mm), joint finisher and two coats of primer suitable for board as per manufacture's specification and direction of engineer in charge all complete. |       |      |          |          |                       |                      |
| 4.6.1      | 9.105.1    | 75 mm overall thickness partition with 12.5 mm thick double skin fire rated board conforming to IS: 2095: part I  | 1,200 | Sqm  | 1,309.65 |          | 1,571,580.00          | -                    |
|            |            | <b>Sub-total (Brick Work)</b>   |       |      |          |          | <b>189,329,075.25</b> | <b>18,248,916.00</b> |
| <b>5.0</b> | <b>7.0</b> | <b>STONE WORKS</b>  |       |      |          |          |                       |                      |
| 5.1        |            | Coursed rubble masonry (first sort) with hard stone in foundation and plinth with   |       |      |          |          |                       |                      |
| 5.1.1      | 7.6.1      | Cement mortar 1:6 (1 cement : 6 coarse sand)  | 60    | Cum  | 4,639.90 |          | 278,394.00            | -                    |
| 5.2        |            | Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20mm nominal size) upto plinth level with   |       |      |          |          |                       |                      |
| 5.2.1      | 7.1.1      | Cement mortar 1:6 (1 cement : 6 coarse sand)  | 1,000 | Cum  | 3,965.85 |          | 3,965,850.00          | -                    |
|            |            | <b>Sub-total (Stone Work)</b>   |       |      |          |          | <b>4,244,244.00</b>   | <b>-</b>             |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No      | Item Description   | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|------------|--------------|--|-------|-------|----------|----------|------------------|------------------|
| <b>6.0</b> | <b>8.0</b>   | <b>MARBLE &amp; GRANITE WORK</b>   |       |       |          |          |                  |                  |
| 6.1        |              | Providing and fixing 18mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. |       |       |          |          |                  |                  |
| 6.1.2      | 8.2.2        | Granite of any colour and shade  |       |       |          |          |                  |                  |
| 6.1.2.1    | 8.2.2.1      | Area of slab upto 0.50 sqm   | 481   | Sqm   | 3,351.95 |          | 1,612,287.95     | -                |
| 6.1.2.2    | 8.2.2.2      | Area of slab over 0.50 sqm   | 2,903 | Sqm   | 3,113.30 |          | 9,037,909.90     | -                |
| 6.2        | Based on DSR | Providing and fixing Base work for kitchen / pantry platform and vanity counter base in approved 25mm thick semi polished kota stone anchored in wall/floor upto 50mm and finished with neat cement slurry, vertical supports in same kota stone where ever required, properly fixed at floor and walls inclusive of necessary cutting and finishing of floor and wall as directed by engineer incharge.<br>(Area of Counter and partition supports to be measured for payment).   | 3,579 | Sqm   | 765.00   |          | 2,737,935.00     | -                |
| 6.3        |              | Providing edge moulding / Chamfering to 18mm thick stone counters, Vanities, Jams, Sills etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.   |       |       |          |          |                  |                  |
| 6.3.1      | 8.3.2        | Granite Works  | 3,096 | Meter | 245.70   |          | 760,687.20       | -                |
| 6.4        | 8.4          | Extra for fixing marble / granite stone, over and above corresponding basic item, in facia and drops of width upto 150mm with epoxy resin based adhesive, including cleaning etc. complete.  | 3,394 | Meter | 266.25   |          | 903,652.50       | -                |
| 6.5        | 8.5          | Extra for providing opening of required size & shape for wash basin / kitchen sink in kitchen platform, vanity counter and similar location in marble/ Granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.   | 1,422 | Each  | 427.95   |          | 608,544.90       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No         | Item Description  | Qty    | Unit | DSR Rate  | NSR Rate | Amount DSR Items      | Amount NSR Items |
|------------|-----------------|---|--------|------|-----------|----------|-----------------------|------------------|
| 6.6        |                 | Providing and fixing machine cut, mirror / eggshell polished, Granite Stone work for wall lining (veneer work) including dado, skirting, risers of steps etc., in required design and pattern wherever required, stones of different finished surface texture, on 12mm (average) thick cement mortar 1:3 (1 cement : 3 coarse sand) laid and jointed with white cement slurry @ 3.3 kg/sqm including pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing, polishing etc. all complete as per Architectural drawings, and as directed by the Engineer-in-Charge. |        |      |           |          |                       |                  |
| 6.6.1      | Based on 8.11.1 | 18mm thick Granite slab of Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.   | 3,125  | Sqm  | 4,696.00  |          | 14,675,000.00         | -                |
| 6.7        |                 | Providing and laying Polished / Flammed / Honned Finished Granite stone flooring, treads, landings etc in required design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18mm thick stone slab over 20mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.               |        |      |           |          |                       |                  |
| 6.7.1      | Based on 8.13.1 | Granite stone slab to be jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.   | 41,895 | Sqm  | 2,938.00  |          | 123,087,510.00        | -                |
|            |                 | <b>Sub-total (Marble &amp; Granite Work)</b>  |        |      |           |          | <b>153,423,527.45</b> | <b>-</b>         |
| <b>7.0</b> | <b>9.0</b>      | <b>WOOD &amp; PVC WORK</b>  |        |      |           |          |                       |                  |
| 7.1        |                 | Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately).  |        |      |           |          |                       |                  |
| 7.1.1      | 9.1.1           | Second class teak wood  | 14     | Cum  | 92,743.05 |          | 1,298,402.70          | -                |
| 7.2        |                 | Providing and fixing expandable fasteners of specified size with necessary polyamide PA 6 grade sleeves and and gleitmo coated galvanized steel grade 6.8 screws including drilling holes in masonry work / Cement Concrete / R.C.C. and making good etc. complete.   |        |      |           |          |                       |                  |
| 7.2.1      | NSR             | Size 10mm dia x 140mm Long  | 19,540 | Each |           | 65.00    | -                     | 1,270,100.00     |
| 7.3        |                 | Providing and fixing ISI marked Flush Door shutters conforming to IS : 2202 (part I) of approved make.  |        |      |           |          |                       |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No       | Item Description   | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------------|--|--------|------|----------|----------|------------------|------------------|
| 7.3.1 | Based on 9.21 | 30mm thick with SS Ball Bearing Hinges of size 100 x 75 x 3mm satin finished of approved make with necessary SS screws for wooden doors  | 6,743  | Sqm  | 2,433.00 |          | 16,405,719.00    | -                |
| 7.4   |               | Providing & Fixing decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S, including cost of Low VOC adhesive of approved quality. |        |      |          |          |                  |                  |
| 7.4.1 | 9.127.2       | 1.0mm thick  | 13,487 | Sqm  | 518.00   |          | 6,986,266.00     | -                |
| 7.4.2 | 9.127.1       | 1.5mm thick  | 2,230  | Sqm  | 837.40   |          | 1,867,402.00     | -                |
| 7.5   |               | Extra if louvers (not exceeding 0.2 sqm) are provided in flush door shutters (overall area of door shutters to be measured).   |        |      |          |          |                  |                  |
| 7.5.1 | 9.25.1        | Decorative type door   | 1,009  | Sqm  | 377.50   |          | 380,897.50       | -                |
| 7.6   | Based on 9.23 | Extra for providing lipping with 2nd class teak wood battens 6mm minimum depth on all edges of flush door shutters (over all area of door shutter to be measured).   | 6,743  | Sqm  | 88.00    |          | 593,384.00       | -                |
| 7.7   |               | Extra for providing vision panel not exceeding 0.1 sqm in all type of flush doors (cost of glass excluded) (overall area of door shutter to be measured):  |        |      |          |          |                  |                  |
| 7.7.1 | 9.24.1        | Rectangular or square.   | 2,162  | Sqm  | 162.60   |          | 351,541.20       | -                |
| 7.8   |               | Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item):       |        |      |          |          |                  |                  |
| 7.8.1 | 9.7.7.2       | With float glass panes of 5.50 mm thickness  | 389    | Sqm  | 1,456.80 |          | 566,695.20       | -                |
| 7.9   | 9.26          | Extra for cutting rebate in flush door shutters (Total area of the shutter to be measured).  | 2,162  | Sqm  | 127.75   |          | 276,195.50       | -                |
| 7.10  | NSR           | Supply and Installation lever action tower bolt of approved make, size 250mm x 20mm for door in satin chrome SS 304 grade with necessary screws etc. complete all as per manufacturer's specifications.  | 1,273  | Each |          | 967.00   | -                | 1,230,991.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No   | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-------|------|----------|----------|------------------|------------------|
| 7.11    | NSR     | Supply and Installation lever action tower bolt of approved make, size 150mm x 20mm for door in satin chrome SS 304 grade with necessary screws etc. complete all as per manufacturer's specifications.   | 1,273 | Each |          | 913.00   | -                | 1,162,249.00     |
| 7.12    | NSR     | Supply and Installation of SS 304 grade Handles, of approved make with necessary screws etc. complete.  |       |      |          |          |                  |                  |
| 7.12.1  | NSR     | "H" type Stainless Steel (304 grade) stain finished pull handle of approved make, back to back fixing accessories, wood and metal doors. The pull handles should have supporting washer with raised bevelling on the outer surface, SS 304 grade. Size 25 x 450mm   | 647   | Pair |          | 3,797.00 | -                | 2,456,659.00     |
| 7.12.2  | NSR     | Rectangular Concealed Shaft Door Handle. H 102mm x W45mm<br>Material: Stainless Steel (304 grade)   | 244   | Each |          | 630.00   | -                | 153,720.00       |
| 7.12.3  | NSR     | "H" type Stainless Steel (304 grade) stain finished pull handle of approved make, back to back fixing accessories, wood and metal doors. The pull handles should have supporting washer with raised bevelling on the outer surface, SS 304 grade. Size 25 x 600mm   | 380   | Pair |          | 4,391.00 | -                | 1,668,580.00     |
| 7.13    |         | Providing and fixing Stainless Steel (304 grade) door stopper, of approved make ISI marked, with necessary screws etc. complete.  |       |      |          |          |                  |                  |
| 7.13.1  | NSR     | Half Moon Floor mounted   | 1,916 | Each |          | 261.00   | -                | 500,076.00       |
| 7.13.12 | NSR     | Wall door stop 82mm projection  | 995   | Each |          | 395.00   | -                | 393,025.00       |
| 7.14    | NSR     | Providing and fixing of Pair Design Lever Handle on Roses & escutcheons of approved make inclusive of mortise sash lock, Escutcheon etc complete.<br>Lever Handle: 19mm dia Lever handle sprung loaded on with dia.53x10(H)mm rose, steel base in T1.2mm. Supplied with bolt through fixing & decorative ring. Suitable for 40 to 50mm door thickness, Grub screw fixing onto 8mm x 110mm spindle. Longer spindle available for thicker door. Material: Stainless Steel 304, Finish: Satin, Size: 135mm x 65mm projection from door surface. packed with 4pcs 8#x20mm wooden screw.Escutcheon included.<br>55mm backset Sash lock with double through deadlocking dead bolt,and latch bolt, forend & strike plate; forend size: 20x235mm; backset:55mm, distance: 72mm<br>5 pin Euro profile knob cylinder with 3 keys, 70mm length<br>Escutcheon 53mm (dia) x 10(H)mm made of SS 304 in satin finish with 38mm fixina center Supplied with 2 covers & 2 bases. | 2,495 | Pair |          | 4,883.00 | -                | 12,183,085.00    |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 7.15  | NSR     | Providing and fixing of Pair Design Lever Handle on Roses & escutcheons of approved make inclusive of mortise sash lock, Escutcheon etc complete.<br>Lever Handle: 19mm dia Lever handle sprung loaded on with dia.53x10(H)mm rose, steel base in T1.2mm. Supplied with bolt through fixing & decorative ring. Suitable for 40 to 50mm door thickness, Grub screw fixing onto 8mm x 110mm spindle. Longer spindle available for thicker door. Material: Stainless Steel 304, Finish: Satin, Size: 135mm x 65mm projection from door surface. packed with 4pcs 8#x20mm wooden screw.Escutcheon included.<br>55mm backset Sash lock with double through deadlocking dead bolt,and latch bolt, forend & strike plate; forend size: 20x235mm; backset:55mm, distance: 72mm<br>Euro profile of 70mm length inner side thumb turn and outer side emergency release<br>Escutcheon 53mm (dia) x 10(H)mm made of SS 304 in satin finish with 38mm fixing center Supplied with 2 covers & 2 bases. | 633   | Pair |          | 4,384.00 | -                | 2,775,072.00     |
| 7.16  | NSR     | Providing and Fixing Dead Lock of approved make , 155mm backset double through Dead lock with 20mm bolt projection body in Powder coated finish includes SS 304 forend of size: 20 x 235mm, strike plate & fixing screws for wooden / metal door.<br>5 pin Euro profile knob cylinder with 3 keys, 70mm length<br>Escutcheon 53mm (dia) x 10(H)mm made of SS 304 in satin finish with 38mm fixing center Supplied with 2 covers & 2 bases.   | 1,328 | Each |          | 3,443.00 | -                | 4,572,304.00     |
| 7.17  | NSR     | Providing and fixing Mortice shaft dead bolt / Lock with alen key of approved make, with BS 57mm and 25mm Sq forend with escutcheons in SS 304 grade.  | 244   | Each |          | 622.00   | -                | 151,768.00       |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 7.18  | NSR     | Supply & fixing of fully insulated wooden fire door of approved make of 120min. fire rating, of minimum 50mm thickness, comprising of 75mm x 44mm hardwood internal timber frame work, with infill insulation of 20mm thick of 96 kg/m <sup>3</sup> , wool insulation, coated with intumescent coating on both sides for insulation. The coated insulation shall be sandwiched between min 12mm thick Non Combustible (Calcium Silicate) Boards on both sides (edge to edge on internal Hardwood frame) and clad with 3mm thick Commercial ply & 1mm thick Laminate (approved shade and colour) on both sides, with 50mm x 14mm exposed teak wood lipping all round the shutter. The shutter shall be fitted with fire & smoke intumescent seal of size 20 x 4mm on all the three sides except bottom. The pasting of the ply / laminate should be done using automatic machine and should be free from any nails or perforations. |       |      |          |          |                  |                  |
|       |         | The board shall be Resistant to vermin, mould growth, minor impact, abrasion and short term water attack and shall be Off –white in colour with a smooth surface suitable to receive most forms of decoration having following technical characters i.e.; The Construction design similar to NWD12050 and similar to the design tested as per BS 476 part 22 and IS 3614 Part II, at CBRI, Roorkee or equivalent lab. The shutter can be provided with appropriate openings for view panel glass, if required. The shutter shall be fixed with the frame with the help of 4nos of SS Ball Bearing hinges CE marked per shutter, of size 100x75x3mm of approved make.   | 1,771 | Sqm  |          | 8,809.00 | -                | 15,600,739.00    |
| 7.19  | NSR     | Providing and fixing wooden fire rated door frames as per BS: 476 part 22, IS:3614 Part II as per the prototype certified by CBRI Roorkee or equivalent lab, frame to be made out of 2nd class Teak Wood (Ivory Coast) frame of section 120mm x 70mm for fire resistant doors of 120 minutes fire rating, with heat activated intumescent fire seal strips of size 02 nos. x 10 x 4mm (for smoke sealing) provided in grooves on all three sides of the frame with one coat of approved brand of fire retardant primer including two coats of fire retardant paint FRS 881 un thinned on cleared hard wood surface of door frames (@3.5 sq.m. per litre per coat) including preparation of base surface as per recommendations of manufacturer to make the surface fire retardant, including fixing the frame with 8 nos. 100mm long, 10mm dia metal dash fastners complete as per directions of the Engineer in charge.           | 3,649 | Rmt  |          | 2,451.00 | -                | 8,943,699.00     |
| 7.20  | NSR     | Providing and fixing UL listed door Co-ordinator of approved Make for coordination of double leaf 120 min fire rated doors, of approved brand and manufacture  | 107   | Each |          | 9,935.00 | -                | 1,063,045.00     |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-------|------|----------|-----------|------------------|------------------|
| 7.21   | 9.84    | Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm), with double speed adjustment with necessary accessories and screws etc. complete.  | 3,303 | Each | 388.40   |           | 1,282,885.20     | -                |
| 7.22   |         | Providing and fixing of UL listed fire rated single / double leaf panic exit devices and Panic Trim tested in accordance with BS - N 1125: 1997 & BS - N 179: 1997b - N 1670 (Corrosion Resistant) & BS 476 Part 22 (for fire rating) with min. one year warranty.  |       |      |          |           |                  |                  |
| 7.22.1 | NSR     | Single Leaf Panic Bar   | 290   | Each |          | 7,418.00  | -                | 2,151,220.00     |
| 7.22.2 | NSR     | Single Leaf Panic Trim  | 290   | Each |          | 6,226.00  | -                | 1,805,540.00     |
| 7.22.3 | NSR     | Double Leaf Panic Bar   | 50    | Each |          | 18,148.00 | -                | 907,400.00       |
| 7.23   |         | Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge. |       |      |          |           |                  |                  |
| 7.23.1 | 21.4.1  | With stainless steel cover plate minimum 1.25mm thickness   | 166   | Each | 2,054.40 |           | 341,030.40       | -                |
| 7.24   | 21.18   | Providing and fixing 12mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-charge (Door handle, lock and stopper etc. to be paid separately).   | 335   | Sqm  | 4,608.85 |           | 1,543,964.75     | -                |
| 7.25   | NSR     | Providing and fixing Electromagnetic Lock code no 98207311 of Geze / Hafele / Godrej or equivalent make. Lock to be 600LBS (3000N) LED, Lock & Door sensor with Armature Plate fitted in the Door Leaf. With Built in Reed contact, Hall Effect IC & Bi-Color LED. Surface Mounted with Holding force of 250Kg. 24V DC. Fail Safe Security. Satin anodised aluminium finish (Including mounting bracket)  | 52    | Each |          | 8,263.00  | -                | 429,676.00       |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 7.26  | NSR     | Providing & fixing of Wooden lead lined door from Single / Double leaf to required sizes of approved make, consists of frame, shutter and finish as detailed below. Door frame shall be Single rebate profile of size 120 x 70 mm made out of teak Wood (Ivory Coast). Frames shall be Butt jointed and field assembled with self tabs. The Shutter & Frame Shall be fully lead lined of min of 2mm lead Sheet with 99% purity and as defined by AERB. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Rubber door silencers should be provided on the striking jamb. Frames should be fixed by anchor fasteners for installation on a finished plastered masonry wall opening. Door leaf shall be 44 mm thick with commercial ply & 1mm laminate both side. incase vision lite is required it shall be only Lead Glass as recomomnded by AERB/DRC. The internal construction of the door should be rigid with lead line of 2mm thick all across the inside of the exposed surface. In addition the door should have a basic infill ROCK WOOL with necessary reinforcement both on top and bottom. All doors should be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers as per ANSI Standard .The door Leaf & Frame shall be in a position so that Lead Line should overlap. | 10  | Sqm  |          | 24,838.00 | -                | 248,380.00       |
| 7.27  | 9.161   | Providing and fixing fire resistant door frame of section 50 x 60mm on horizontal side & 35 x 60 mm on vertical sides having built in rebate made out of 1.6 mm thick GI sheet ( Zinc coating not less than 120gm/m <sup>2</sup> ) suitable for mounting 120 min Fire Rated Glazed Door Shutters. The frame shall be filled with Mineral wool Insulation having density min 96Kg/m <sup>3</sup> . The frame will have a provision of G.I. Anchor fastners 14 nos ( 5 each on vertical style & 4 on horizontal style of size M10 x 80 ) suitable for fixing in the opening along with Factory made Template for SS Ball Bearing Hinges of Size 100x89x3mm for fixing of fire rated glazed shutter. The frame shall be finished with a approved fire resistant primer or Powder coating of not less than 30 micron in desired shade as per the directions of Engineer - in- charge. (Cost of SS ball bearing hinges is excluded).   | 681 | Rmt  | 1,260.00 |           | 858,060.00       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 7.28  | 9.162   | Providing and fixing 60mm thick glazed fire resistant door shutters of 120 min Fire Rating confirming to IS:3614 (Part II) or EN1634- 1:1999, tested and certified as per laboratory approved by Engineer-in-charge, with suitable mounting on door frame, consisting of vertical styles, top rail & side rail 60 mm x 60 mm wide and bottom rail of 110 mm x 60 mm made out of 1.6mm thick G.I. sheet (zinc coating not less than 120gm/m <sup>2</sup> ) duly filled mineral wool insulation having density min 96 kg/m <sup>3</sup> and fixing with necessary stainless steel ball bearing hinges of size 100x89x3mm of approved make, including applying a coat of approved fire resistant primer or powder coating not less than 30micron etc all complete as per direction of Engineer-in-charge (panelling to be paid for seperately).              | 411 | Sqm  | 6,839.35 |          | 2,810,972.85     | -                |
| 7.29  | 9.163   | Providing and fixing non load bearing fixed frame for fire resistant glazed Partition for 120 min Fire Rating, made out to a profile of dimension 60mm x 70 mm of 1.6 mm thick galvanised steel sheet as per test evidence suitable for fixing fire rated glass for 120 min of both integrity & radiation control (EW120) & minimum 15min of insulation (EI15).The profile has to be fixed to the supporting construction by means of anchor fasteners of size M10 x 80, every 150 mm from the edges and every 500 mm (approx) c/c. Linear measurement of frame shall be measured for payment. The frame shall be filled with mineral wool insulation of density min 96kg/m <sup>3</sup> . and finished with a approved fire resistant primer or Powder coating of not less than 30 micron in desired shade as per the directions of Engineer - in-charge | 257 | Rmt  | 1,260.00 |          | 323,820.00       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate  | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|-----------|----------|------------------|------------------|
| 7.30  | 9.164   | Providing and fixing glazing in fire resistant door shutters and vision panels in door shutters, fixed panels & partitions etc., with G.I. beading made out of 1.6 mm thick G.I. sheet (zinc coating not less than 120 gm/m <sup>2</sup> ) of size 20 x 33 mm screwed with M4 x 38 mm SS screws at distance 75 mm from the edges and 150 mm c/c , including applying a coat of approved fire resistant primer/powder coating of not less than 30micron on G.I. beading, & special ceramic tape of 5 x 20 mm size etc complete in all respect as per direction of Engineer-in-charge. The glass shall be clear, toughened, interlayered, non-wired fire resistant having 11mm thickness of approved brand with 120 minutes of fire resistance both integrity & radiation control (EW120) and minimum 15 min of insulation (EI15) and having a sound reduction of 37dB and LT of 86%. Glass shall be compliant to class 2(B)2 category of Impact Resistance as per EN 12600. The glass should be manufactured in UL & TUV audited Facility and including UL-EU Certification.The maximum glazing size cannot be more than 1100 mm x 2200 mm (w x h) or 2.42 sq mts in total area. The test report for the complete system (Glazed Door or Partition) will be considered valid only if it contains the stamp and signature of the authorized signatory from the glass manufacturer. (Actual glass size is to be measured at site for payments). | 644 | Sqm  | 34,058.90 |          | 21,933,931.60    | -                |
| 7.31  | NSR     | Providing and fixing SS Ball Bearing Hinges CE marked to Glass Fire Rated shutter with the frame, of size 100x75x3mm of approved make fixed with necessary SS Screws.  | 824 | Nos  |           | 408.00   | -                | 336,192.00       |
| 7.32  | NSR     | Providing and fixing fire resistant DOOR FRAME of section 143 X 57 mm having built in rebate made out of 16 gauge stainless steel 304 grade ( hair line brushed finish) duly filled with vermiculite based concrete mix, suitable for mounting 120 minutes fire rated door shutter. The frame is fitted with intumescent fire seal strips of size 10 x 4 mm ( minimum) all-around the frame and fixing with dash fastener of approved size and make complete as per direction of Engineer -In- Charge.   | 66  | Rmt  |           | 2,120.00 | -                | 139,920.00       |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 7.33  | NSR     | Providing and fixing 50mm thick glazed fire resistant DOOR SHUTTER of 120 minutes fire rating conforming to IS: 3614 ( Part - II ) for stability and integrity , tested and certified as per laboratory CBRI Roorkee/ Warrington fire research lab approved by Engineer - in - charge, with suitable, mouting on door frame, consisting of vertical styles, top rail 100mm wide, bottom rail 200 mm wide, made out of 16 gauge stainless steel 304 grade ( hair line brushed finish) duly filled with FR insulation material and fixing with necessary stainless steel ball bearing hinges of approved make, all complete as per direction of Engineer - In - Charge ( The complete assembly of the door shall be tested from CBRI Roorkee with glass and hardwares for both single leaf / double leaf doors prior to the completer supply as per CPWD requirements  | 43  | Sqm  |          | 11,392.00 | -                | 489,856.00       |
| 7.34  | NSR     | Providing and fixing glazing in fire resistant door shutter, fixed panels ventilators and partition etc with stainless steel 304 grade sheet beading of appropriate size, made out of 16 guage stainless steel 304 grade sheet including fire resistant sealent, complete in all respect as per direction of Engineer in charge.<br>With clear fire resistant single layer clear glass panels minimum 6mm thickness for full glazing of approved brand having minimum 120 minutes fire resistance of various sizes and at required locations in the fire doors. The glasses shall be clear borosilicate fully transparent in fire / non fire condition (92% transparency) non - opaque, toughened glass of 120 minutes fire rating and fixing in position with SS beading and sealents at joints etc. complete. The glass shall be tested from CBRI Roorkee / Warrington's Fire research lab with CE certification for glass as per BS-EN 1364 - 1: 1999/BS 476 part 2 / EN 13501-2: 2003 along with the complete assembly of the fire door with complete hardware. The manufacture shall submit the valid test reports fo both single / double leaf doors prior to the manufacturing to the Engineer in Charge. | 43  | Sqm  |          | 36,638.00 | -                | 1,575,434.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No  | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|----------|---|--------|------|----------|----------|------------------|------------------|
| 7.35     |          | Providing and fixing aluminium work for doors, windows, ventilators, partitions, wall panelling with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) : |        |      |          |          |                  |                  |
| 7.35.1   | 21.1.1   | For fixed portion   |        |      |          |          |                  |                  |
| 7.35.1.1 | 21.1.1.1 | Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15)  | 44,733 | Kg   | 355.20   |          | 15,889,161.60    | -                |
| 7.35.1.2 | 21.1.1.3 | Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)   | 35,000 | Kg   | 391.80   |          | 13,713,000.00    | -                |
| 7.36     |          | For shutters of doors, windows & ventilators including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber / neoprene gasket required (Fittings shall be paid for separately)   |        |      |          |          |                  |                  |
| 7.36.1   | 21.1.2.1 | Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15)  | 3,279  | Kg   | 415.05   |          | 1,360,948.95     | -                |
| 7.37     |          | Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item):  |        |      |          |          |                  |                  |
| 7.37.1   | NSR      | 12mm thick clear toughened Glass  | 193    | Sqm  |          | 2,691.00 | -                | 519,363.00       |
| 7.38     |          | Providing and fixing marine plywod 710 Grade IS 710 : 2010 marked, of approved make to existing framework, backing or studding with screws etc. complete as per architectural drawings and as directed by Engineer-in-charge.   |        |      |          |          |                  |                  |
| 7.38.1   | NSR      | 8mm thick Ply   | 450    | Sqm  |          | 1125     | -                | 506,250.00       |
| 7.38.2   | NSR      | 12mm thick Ply  | 1,700  | Sqm  |          | 1349     | -                | 2,293,300.00     |
| 7.38.3   | NSR      | 18mm thick Ply  | 550    | Sqm  |          | 1865     | -                | 1,025,750.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No              | Item Description   | Qty   | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|----------------------|--|-------|------|----------|-----------|------------------|------------------|
| 7.39     | NSR                  | Providing and fixing of 6mm thick lacquered glass of approved shade, colour and make on the ply wood for wall lining, partitions, boxing of required sizes as per architectural drawings. Glass to be stuck on ply with approved 2mm thick transparent UHP Acrylic Foam Tapes (Pentagon BOW - 720T or 3M VHB – 4918 or equivalent) as per tape manufactures specifications. All edges of lacquered glass to be machine polished etc complete and as directed by Engineer in charge.  | 245   | Sqm  |          | 2,676.00  | -                | 655,620.00       |
| 7.40     | NSR                  | Providing and fixing of 6mm thick extra clear mirror of approved make on the ply wood for wall lining, partitions, boxing of required sizes as per architectural drawings. Mirror to be stuck on ply with approved 1.5mm thick transparent UHP Acrylic Foam Tapes (Pentagon BOW - 715T or 3M VHB – 4915 or equivalent) as per tape manufactures specifications. All edges of lacquered glass to be machine polished etc complete and as directed by Engineer in charge.  | 130   | Sqm  |          | 2,826.00  | -                | 367,380.00       |
| 7.41     |                      | Providing and fixing wooden beading 12mm thick of approved shapes and at required area as frames with iron screws, plugs and priming coat on unexposed surface etc. complete.  |       |      |          |           |                  |                  |
| 7.41.1   |                      | 2nd class teak wood  |       |      |          |           |                  |                  |
| 7.41.1.1 | Based on<br>9.40.1.1 | 25mm wide  | 1,400 | Rmt  | 60.00    |           | 84,000.00        | -                |
| 7.41.1.2 | 9.40.1.1             | 50mm wide  | 1,400 | Rmt  | 119.65   |           | 167,510.00       | -                |
| 7.42     | NSR                  | Supply & fixing of Fire-stop Fire sealing System Board Type (barriers) of approved make for sealing of floors, wall openings under control panels for the purpose of compartmentation.The FPSS consists of 100mm thick mineral wool insulation pad of approved make having density of 48 kg/m <sup>3</sup> coated with FR in tumescent compound encased with 10 mm thick calcium silicate board of approved make, sealed with intumescent Fire Seal Putty of approved Make. The system is coated and fixed with openings with the help of slotted angles of size 40x40mm of 16 SWG thickness, nutbolts of size 1.5"x8mm Dia. The FPSS system all provide 2 hours fire rating as per IS 12458-1989.After insulation of this system it will be painted with Fire Retardant Paint of approved Make. | 431   | Sqm  |          | 14,572.00 | -                | 6,280,532.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No     | Item Description  | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items |                      |
|------------|-------------|---|---------|------|----------|----------|----------------------|------------------|----------------------|
| 7.43       | NSR         | Providing and fixing automatic sliding door operator of approved brand and manufacture for a door of clear passage width ranging from 2500-3000 mm consisting of 6.25 mtr long operator with track profiles, glass clamping rails, floor guide, Radar eagle 6 sensors, 5 programme switch with knob, light barrier EM lock and cable for programme switch all complete of approved brand and quality, complete to the satisfaction of engineer in charge. nothing extra is payable if some civil work is required for fixing of the system. (Cost of glass to be paid seperately) | 2       | Nos  |          |          | 295,075.00           | -                | 590,150.00           |
| 7.44       | 12.62       | Providing and fixing thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m3, 50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screws, rawel plug & washers and held and in position by criss crossing GI wire etc. complete as per directions of Engineer-in-Charge.  | 1,200   | Sqm  | 223.80   |          | 268,560.00           | -                |                      |
|            |             | <b>Sub-total (Wood Work &amp; PVC)</b>  |         |      |          |          | <b>89,304,348.45</b> |                  | <b>74,447,075.00</b> |
| <b>8.0</b> | <b>10.0</b> | <b>STEEL WORK</b>   |         |      |          |          |                      |                  |                      |
| 8.1        |             | Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer having VOC content less than 250 grams/litre, including welding and bolted with special shaped washers etc. complete.  |         |      |          |          |                      |                  |                      |
| 8.1.1      | 10.16.2     | Hot finished seamless type tubes  | 132,000 | Kg   | 93.90    |          | 12,394,800.00        | -                |                      |
| 8.2        |             | Steel work welded in built up sections / framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer having VOC content less than 250 grams/litre, using structural steel etc. as required.   |         |      |          |          |                      |                  |                      |
| 8.2.1      | 10.25.1     | In stringers, treads, landings etc. of staircases, including use of chequered plate wherever required, all complete.  | 10,000  | Kg   | 65.80    |          | 658,000.00           | -                |                      |
| 8.2.2      | 10.25.2     | In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works   | 2,000   | Kg   | 85.95    |          | 171,900.00           | -                |                      |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items |
|-------|---------|---|--------|------|----------|----------|----------------------|------------------|
| 8.3   | 10.28   | Providing and fixing stainless steel (Grade 304) railings made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners | 20,705 | Kg   | 472.40   |          | 9,781,042.00         | -                |
| 8.4   |         | Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.  |        |      |          |          |                      |                  |
| 8.5.1 | 10.6.1  | 80x1.25 mm M.S. laths with 1.25 mm thick top cover  | 30     | Sqm  | 2,316.10 |          | 69,483.00            | -                |
| 8.6   | 10.7    | Providing and fixing ball bearing for rolling shutters.   | 10     | Nos  | 379.30   |          | 3,793.00             | -                |
| 8.7   | 10.9    | Extra for providing grilled rolling shutters manufactured out of 8 mm dia M.S. bar instead of laths as per design approved by Engineer-in- charge, (area of grill to be measured).  | 5      | Sqm  | 313.60   |          | 1,568.00             | -                |
| 8.8   | 10.8    | Extra for providing mechanical device chain and crank operation for operating rolling shutters.   | 30     | Sqm  | 724.05   |          | 21,721.50            | -                |
|       |         | <b>Sub-total (Steel Work)</b>   |        |      |          |          | <b>23,102,307.50</b> | <b>-</b>         |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No      | Code No     | Item Description  | Qty    | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|------------|-------------|---|--------|-------|----------|----------|------------------|------------------|
| <b>9.0</b> | <b>11.0</b> | <b>FLOORING WORK</b>  |        |       |          |          |                  |                  |
| 9.1        |             | Kota stone slab flooring over 20mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand)   |        |       |          |          |                  |                  |
| 9.1.1      | 11.26.1     | 25mm thick  | 6,405  | Sqm   | 1,158.10 |          | 7,417,630.50     | -                |
| 9.2        |             | Kota stone slabs 20mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.   | 460    | Sqm   | 1,238.20 |          | 569,572.00       | -                |
| 9.3        | 11.31       | Extra for pre finished nosing in treads of steps of Kota stone/ sand stone slab.  | 446    | Meter | 84.85    |          | 37,843.10        | -                |
| 9.4        | 11.32       | Extra for Kota stone/ sand stone in treads of steps and risers using single length up to 1.05 metre.  | 175    | Sqm   | 18.95    |          | 3,316.25         | -                |
| 9.5        | 11.36       | Providing and fixing 1st quality Ceramic wall Tiles conforming to IS: 15622 (thickness to be specified by the manufacturer) of approved make in all colours and shades of any size as approved by Engineer-in-Charge in skirting and dados over 12mm thick bed of cement Mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete. | 31,493 | Sqm   | 744.80   |          | 23,455,986.40    | -                |
| 9.6        | 11.40       | Providing and laying rectified Glazed Ceramic floor tiles of size 300 x 300mm or more (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in all colours, shades as approved, laid on 20mm thick Cement Mortar 1:4 (1 Cement : 4 Coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including pointing the joints with white cement and matching pigments etc., complete.             | 4,558  | Sqm   | 901.05   |          | 4,106,985.90     | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|--------|------|----------|----------|------------------|------------------|
| 9.7   |         | Providing and laying Vitrified Floor Tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including grouting the joints with white cement and matching pigments etc., complete.   |        |      |          |          |                  |                  |
| 9.7.1 | 11.41.2 | 600mm x 600mm   | 41,029 | Sqm  | 1,119.40 |          | 45,927,862.60    | -                |
| 9.7.2 | 11.41.4 | 1000mm x 1000mm   | 17,584 | Sqm  | 2,057.85 |          | 36,185,234.40    | -                |
| 9.8   |         | Providing and laying Vitrified Wall Tiles in different sizes (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting and Dado, over 12mm thick bed of cement mortar 1:3 (1cement : 3 coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including grouting the joint with white cement & matching pigments etc. complete.   |        |      |          |          |                  |                  |
| 9.8.1 | 11.46.2 | 600mm x 600mm   | 11,347 | Sqm  | 1,135.20 |          | 12,881,114.40    | -                |
| 9.8.2 | 11.46.4 | 1000mm x 1000mm   | 1,261  | Sqm  | 2,075.70 |          | 2,617,457.70     | -                |
| 9.9   | NSR     | Providing & fixing 2mm thick homogeneous PVC Vinyl flooring of approved make with a single layer of PVC, total weight is 3250 g/m2, good resistance of scratch, slip, chemical and fire, doesn't favor in growth of fungi & bacteria. Low VOC emissions after 28days of installation. Phthalate Free. Directional in Design. The floor finish should terminate at the room perimeter passing over a concealed cove forming and continuing up on the wall upto 100mm. Covered area of floor and skirting to be measured for payment. | 2,024  | Sqm  |          | 1,781.00 | -                | 3,604,744.00     |
| 9.10  | NSR     | Extra for providing and fixing coving of suitable material for PVC flooring including the cost of labour and materials for coving. Length of coving shall be measured for payment.  | 4,750  | Rmt  |          | 165.00   | -                | 783,750.00       |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|------|----------|----------|------------------|------------------|
| 9.11  | NSR     | Providing and fixing PVC Vinyl Accoustic flooring over fiberglass mat PVC foam backing (EN 14904). Total thickness is 3.35mm (EN 428/EN 427). Wear layer thickness is 0.65mm (EN 429). Anti-bacteria and Anti-fungus surface treatment (Sanitized). TOP CLEAN XP reinforced. Total weight is 3240g/m2 (EN 430), Dimentional Stablity <0.10%(EN-434),Reaction to fire (EN 13501-1) Bfl s 1 on fibre cement substrate), Static indentation ( EN 433: 0.12mm ), Castor chair test qualified –No damage(EN-425), furniture leg test qualified (EN 424)-No damage, underfoot comfort (EN 433) ≥ 0.40mm,Impact Sound reduction(EN ISO 140-8,EN ISO 717-2 )Δlw 19Db, Acoustical Improvement (NF S31-074)-Class A,Certificat NF UPEC.A+(NF 189)-Registered, no formaldehyde emission (EN 717-1), no Pentachlorophenol (EN 12673), Low VOC emissions after 28days of installation (lower than ≤100µg/m3), Chemical resistance test qualified (EN-423)-High resistance, Thermal and underfloor heating test qualified(EN12524)-Suitable & slip resistant. | 550   | Sqm  |          | 3,206.00 | -                | 1,763,300.00     |
| 9.12  | NSR     | Providing and fixing Permanently Static Dissipative pressed homogeneous vinyl flooring (EN 649) ,anti static, wear layer thickness is 2mm (EN429), PVC Vinyl flooring having Carbon backing a with total weight 3000 g/m2 (EN 430), XR PUR (polyurethane reinforced) ,Abrasion group P:≤4,0mm, residual indentation approx. 0,02 mm, castor wheel test qualified, dimensional stability ≤0.40%,static electrical charge < 2kv, good resistance of scratch, slip, chemical and fire, doesn't favor in growth of fungi. Electric resistance is as per EN 1081 and ESD approved. Restorable properties. Available in rolls. 100% recyclable. Low VOC emission after 28days of installation (lower than ≤100µg/m3). Non Directional in Design. The flooring should be laid on the .05 mm thick copper grid having grid of the size of 1mtr x 1 mtr.The grid is connected with earth point.  | 1,810 | Sqm  |          | 2,351.00 | -                | 4,255,310.00     |
| 9.13  |         | Providing and fixing removable raised / false access flooring with system and its components of approved make for different plenum height with possible height adjustment upto 50 mm, comprising of modular load bearing floor panels supported on G.I. rectangular stinger frame work and G.I. Pedestal etc. all complete, as per the architectural drawings, as specified and as directed by Engineer-incharge consisting of  |       |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|----------|------------------|------------------|
|        |         | a) Providing at required spacing to form modular framework, pedestals made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mm x 100mm x 3mm at the bottom of the pedestal tube, G.I. pedestal head of size 75mmx75mmx3.5 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto 50mm, locking and stabilizing the pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) through base plate using epoxy based adhesive of approved make or the machine screw with rawl plug.  |     |      |          |          |                  |                  |
|        |         | b) Stringers system in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterrupted clearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge.  |     |      |          |          |                  |                  |
|        |         | c) Providing and fixing Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones. The top and bottom plates of Steel Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20 welds along each flange). The panel should be corrosion resistant epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with Pyrogrip noncombustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm. The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without collapse in the centre of the panel which is placed on four steel blocks. The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and, an impact load of 50kg all complete as per the approved manufacturers specification and as per the direction of Engineer-in-charge. All specification must be printed on the side of the panel to ensure the quality of the product. |     |      |          |          |                  |                  |
| 9.13.1 | 11.54.2 | 450mm Finished Floor Height (FFH).   | 200 | Sqm  | 4,275.40 |          | 855,080.00       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No   | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-------|------|----------|----------|------------------|------------------|
| 9.14     | 11.53     | Providing and fixing Glass mosaic tiles on finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design , fixing in approved design. The glass mosaic tiles shall be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. All completed as per direction of Engineer-incharge.   | 1,162 | Sqm  | 1,603.75 |          | 1,863,557.50     | -                |
| 9.15     |           | Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry, but excluding the cost of nosing of steps etc. complete.   |       |      |          |          |                  |                  |
| 9.15.1   | 11.3.1    | 40mm thick with 20mm nominal size stone aggregate  | 7,434 | Sqm  | 362.60   |          | 2,695,568.40     | -                |
| 9.16     |           | Cement plaster skirting up to 30cm height, with cement mortar 1:3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement.  |       |      |          |          |                  |                  |
| 9.16.1   | 11.6.1    | 18 mm thick  | 645   | Sqm  | 350.05   |          | 225,782.25       | -                |
| 9.17     |           | Providing and fixing 10mm thick acid and/or alkali resistant tiles of approved make and colour using acid and/or alkali resisting mortar bedding, and joints filled with acid and/or alkali resisting cement as per IS : 4457, complete as per the direction of Engineer-in- Charge.   |       |      |          |          |                  |                  |
| 9.17.1   |           | In flooring on a bed of 10 mm thick mortar 1:4 (1 acid proof cement : 4 coarse sand)   |       |      |          |          |                  |                  |
| 9.17.1.1 | 11.21.1.1 | Acid and alkali resistant tile   | 180   | Sqm  | 1,073.35 |          | 193,203.00       | -                |
| 9.17.2   |           | In dado/skirting on 12mm thick mortar 1:4 (1 acid proof cement : 4 coarse sand)  |       |      |          |          |                  |                  |
| 9.17.2.1 | 11.21.2.1 | Acid and alkali resistant tile   | 12    | Sqm  | 1,143.60 |          | 13,723.20        | -                |
| 9.18     |           | Providing and laying machine cut, mirror polished Marble stone flooring, in required design (Simple geometrical, abstract etc.) and in patterns in combination with Italian marble stones of different colours, shades and finished surface texture etc, in linear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab laid over 20mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with white cement slurry @ 4.4 kg/sqm including pointing with white cement slurry admixed with pigment to match the marble shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge. |       |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| <b>S. No</b>                      | <b>Code No</b> | <b>Item Description</b>   | <b>Qty</b> | <b>Unit</b> | <b>DSR Rate</b> | <b>NSR Rate</b> | <b>Amount DSR Items</b> | <b>Amount NSR Items</b> |
|-----------------------------------|----------------|---|------------|-------------|-----------------|-----------------|-------------------------|-------------------------|
| 9.18.1                            | 11.52.1        | 18mm thick Italian Marble stone slab, Perlato, Rosso verona, Fire Red or Dark Emperadore etc.   | 100        | Sqm         | 5,233.75        |                 | 523,375.00              | -                       |
| 9.19                              |                | Providing and fixing machine cut, mirror / eggshell polished, Marble stone work for wall lining (veneer work) including dado, skirting, risers of steps etc., in required design and pattern wherever required, stones of different finished surface texture, on 12 mm (average) thick cement mortar 1:3 (1 cement : 3 coarse sand) laid and jointed with white cement slurry @ 3.3 kg/sqm including pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing, polishing etc. all complete as per Architectural drawings, and as directed by the Engineer-in-Charge. |            |             |                 |                 |                         |                         |
| 9.19.1                            | 8.11.1         | 18mm thick Italian Marble stone slab, Perlato, Rosso verona, Fire Red or Dark Emperadore etc.   | 100        | Sqm         | 6,647.35        |                 | 664,735.00              | -                       |
| 9.20                              | 11.34          | 38mm thick wood block flooring of first class teak wood laid over 25mm thick leveling layer of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm nominal size) to be paid separately, coated with a thin layer of hot bitumen penetration 80/25 (blown type) @ 2.45 kg per sqm, including fixing blocks in position after dipping in hot bitumen (blown type) up to half depth, planed, levelled smooth and finished complete.   | 350        | Sqm         | 7,266.95        |                 | 2,543,432.50            | -                       |
| <b>Sub-total (Flooring Works)</b> |                |   |            |             |                 |                 | <b>142,781,460.10</b>   | <b>10,407,104.00</b>    |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-------|------|----------|----------|------------------|------------------|
| <b>10.0</b> |         | <b>ACOUSTICAL WORKS</b>   |       |      |          |          |                  |                  |
| 10.1        | NSR     | Supply and installation of False Ceiling System having tiles ADVANTAGE E with micro look edge and 15mm thickness tiles or equivalent make, easily demountable tile, Option of weekly dusting, vacuum cleaning, manufactured from High density glass wool, visible surface is a batch painted glass tissue in white, back of the tile covered with glass tissue. 83% light reflectance. Tiles classified under sound absorption class A with "alpha w " value of 0.95 at minimum 200mm o.d.s. Sound absorption test results measured according to EN ISO 354 and classification according to EN ISO 11654 and the single value rating for NRC value - 0.9 according to ASTM C 423 . Tiles should have white colour " White 500 " nearest NCS colour sample S 0500 - N with . Tiles withstand a permanent ambient RH up to 95% at 30 degree C without sagging , warping and delaminating ( ISO 4611). Thermal resistance (Lambda value - 0,035-0,04 W/mK). Certified by the Indoor Climate labeling , emission class M1 for building materials and recommended by Swedish Asthma and Allergy Association. Product Certified under GRIHA council of India for Green Ratings . Fully recyclable . The glass wool core of the tiles is tested and classified as non combustible according to EN ISO 1182 with reaction to fire classification class A2 s1 d0 according to EN 13501 - 1 - European Standard. Tiles should have a re-cycled content of more than 70% Systems are classified as fire protective covering according to NT FIRE 003. Rate to be inclusive of approved GI exposed grid system as per manufactures specifications | 3,112 | Sqm  |          | 1,568.49 | -                | 4,881,140.88     |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 10.2  | NSR     | Supply and installation of False Ceiling System having tiles of SOMBRA A or equivalent make, 15mm thickness, square edge tiles, Easily demountable, Option of weekly dusting, vacuum cleaning. manufactured from high density glass wool . Visible surface is a matt black batch painted glass tissue and the back of the tile is covered with glass tissue. 3-4% light reflectance. Tiles should be classified under sound absorption class A with "alpha w " value of 1 at minimum 200mm o.d.s. classification according to EN ISO 11654, and the single value ratings for NRC value 0.9 according to ASTM C 423. Tiles withstand a permanent ambient RH upto 95% at 30*c without sagging, wrapping or delaminating (ISO 4611). Thermal resistance (Lamda value - 0,035-0,04 W/mK) Certified by the Indoor Climate Labelling, emission class M1 for building materials and recommended by the Swedish Asthma and Allergy Association. Fully recyclable. Glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182 with reaction to fire classification class A2 s1 d0 according to EN 13501 - 1 - European Standard. Systems are classified as fire protective covering according to NT FIRE 003. Rate to be inclusive of approved GI exposed grid system as per manufactures specifications | 1,250 | Sqm  |          | 1,853.67 | -                | 2,317,087.50     |
| 10.3  | NSR     | Providing and Fixing Channelled Woodworks perforated panels of approved make of width 128mm, thickness of 15mm and length 2440 mm or as required by the Architect / approving engineer, made of a high density particle board substrate with a laminated facing as per the approved shade / species & finish and a melamine balancing layer on the reverse side. The boards shall have a special perforation pattern where the visible surface has a ("Helmholtz" fluted perforation of 2mm width and 14mm of visible panel / 4mm width and 28mm visible panel) each. The panels shall provide a minimum sag resistance of RH90 and a fire rating class of 1 as per Part 7 of BS 476. The edges of the panels shall be "tongue-and- grooved" to receive special clips for installation. The back of the perforated panel shall have sound absorbing non-woven acoustical fleece. The panels shall be mounted on special aluminium splines using clips provided by manufactures and approved by the Architect/ Engineer-in- Charge. Installation as per Manufacture specifications.   | 1,103 | Sqm  |          | 5,223.26 | -                | 5,761,255.78     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 10.4  | NSR     | Supply and installation of WALL PANEL A Akutex FT 1200 x 2700mm with 40mm natural square edge or equivalent make, demountable panels with standard approved fabric wrapped around in concealed system with grippers, option of Daily dusting, vacuum cleaning & weekly wet wiping. Panel is manufactured from high density glass wool. Tiles classified under sound absorption class A with "alpha w " value of 1 at minimum 50mm o.d.s. Classification acc to EN ISO 11654, & single value ratings for NRC value 0.95 according to ASTM C 423. Articulation class 230 as per ASTM E1111, ASTM E1110. Panels withstand a permanent ambient RH up to 95% at 30°C without sagging, warping or delaminating (EN13964). Thermal resistance (Lamda value - 0,035-0,04 W/mK) Certified by the Indoor Climate labelling, emission class M1 for building materials & recommended by Swedish Asthma & Allergy Association. Product Certified under GRIHA Council of India for Green ratings. Fully recyclable.The glass wool core of the tiles should be tested and classified as non combustible according to prEN ISO 1182 with reaction to fire classification class A2 s1 d0 according to EN 13501 - 1 - European Standard. (Basic Rate of Fabric to be Rs 400 per Rmt) | 1,510 | Sqm  |          | 6,559.13 | -                | 9,904,286.30     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 10.5  | NSR     | <p>Supply and Installation of the Carpet Flooring of approved shade, colour and make as per specification and direction of engineer in charge.<br/>                     Construction: Level Loop, Tufted Cut &amp; Loop Pile Carpet Tile, Multi-level pattern,<br/>                     Fibre: 6,6 Nylon, Eco Solution Nylon<br/>                     Dye Method : 100% solution dyed<br/>                     Pile Weight : Minimum 712 g/m<sup>2</sup><br/>                     Tufted Yarn weight : Minimum 20oz / sq.mt<br/>                     Gauge : 1/10 or 1/12<br/>                     Total Thickness : 6mm +/-0.5mm<br/>                     Size : as per approved selection<br/>                     Primery Backing : Synthetic, GlasBac®, GlasBac®RE &amp; CushionBac™ or as per Manufactures specifications<br/>                     Warranties : Lifetime commercial<br/>                     Environmental certification: Green Label Plus certification<br/>                     Recyclability : 100%<br/>                     Carpet must be eligible for recycling by the supplying mill or fibre producer to an existing operational third party certified recycling centre; submit program parameters.<br/>                     Micro Cleaning of existing cement/IPS flooring and making dust free surface. Cutting at necessary sections, Pasting with Full Spread Application of approved Pressure Sensitive Adhesive / Water Based / Solvent-Free / Low Odor / CRI Green Label Certified (0 Grams VOC) etc. complete as per manufactures specifications and as directed by Engineer-in-charge.</p> |       |      |          |          |                  |                  |
|       |         | <p>Covering the Carpet with 2 layers of Plastic and removing of same after all work completion and one time Shampooing and before handing over etc complete as per direction of Engineer-in-charge.<br/>                     Supplier shall ensure that the floor surfaces are acceptable and that any issues related to the same are indicated to the architects at the initial stages itself. It shall be the supplier's responsibility to visit the site during the course of the project</p>   | 2,222 | Sqm  |          | 2,494.39 | -                | 5,542,534.58     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 10.6   | NSR     | Providing and fixing of Wooden fire cum accoustic doors as per BS:476 Part- 20 & 22 & IS 3614 part-1 & part-2 for stability, integrity and thermal insulation. 03 Criteria Wooden door confirming to IS 277 with the following specification. Recommended fire door shall have doors tested at CBRI, Roorkee /DIC Haryana for maximum rating of 2hrs tested with or without vision panel. Individual Test certificates should be available for glass used in vision lites confirming the required fire ratings. Any deviation in specification other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory.<br>Door leaf shall be 77mm thick fully flush door with or without vision lite. 77mm thick shutter, comprising of 100mm x 65mm hardwood internal timber frame work, with infill of 41mm thick fire resistant & accoustic wool insulation of 48 Kg/m3 density coated with VIPER FR coating or equivalent make on both sides for insulation. The coated insulation shall be sandwiched between 12mm thick HILUX / PAMTECH Non board or equivalent make |     |      |          |           |                  | -                |
|        |         | Combustible (Calcium Silicate) Board on both sides (edge to edge on internal Hard wood frame and cladded with 6mm thick commercial & 1mm thick laminate (Any Regular Shade), with 77mm x 14mm exposed teak wood beading, 20 x 4mm fire & smoke intumescent seal shall be used for shutter & for the frame 02 Nos. X 10 x 4mm fire and smoke intumescent seal (For Smoke Sealing). The Frame shall be 140 x 90mm of Teak Wood (Ivory Coast) and cotaed with VIPER or equivalent Fire reatrdent Primer. The rebate shall be of 20mm x 79mm in Door Frame to accommodate the shutter in frame The board shall be Resistant to vermin, mould growth, minor impact, abrasion and short term water attack and shall be Off –white in colour with a smooth surface. Rate to be inclusive of finishing of door as per drgs in laminate of approved shade and colour as approved by Engineer in charge suitable to receive most forms of decoration. Hardwares to be paid separately in relavent items.   | 110 | Sqm  |          | 19,009.31 | -                | 2,091,024.10     |
| 10.7   |         | Providing and Fixing of Accoustic Sealing System to Doors<br>Perimeter Seal - for frame-IS:1212, Automatic Door Bottom Drop Seal - for bottom of the shutter- IS:8010Si, Astragal Seal - for meeting style of the double leaf door only-IS:7061Si  |     |      |          |           |                  |                  |
| 10.7.1 | NSR     | For Single Leaf Door Set   | 5   | Set  |          | 17,883.33 | -                | 89,416.65        |
| 10.7.2 | NSR     | For Double Leaf Door Set   | 20  | Set  |          | 25,831.47 | -                | 516,629.40       |
| 10.8   | NSR     | Providing and fixing Auditorium Chairs as per specification given below:   | 778 | Nos  |          | 15,147.00 | -                | 11,784,366.00    |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No     | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items     |
|-------------|-------------|--|-----|------|----------|----------|------------------|----------------------|
|             |             | 1) Seat Assembly: The seat-rest assembly is made up of Polyurethane foam moulded with MS tubular frame insert which is tubular frame made of dia 1.9 +/- 0.02cm x 0.16 +/- 0.013cm thick MS E.R.W round tube with flexible support straps running across the length and width of the frame. The seat has auto - tipup feature making it stay in upright position when not in use enabling clear row passage. Approx seat size 45.5cm (W) x 46.5cm(D)   |     |      |          |          |                  |                      |
|             |             | 2) Back Rest Assemble: The back assembly is made of polyurethane foam moulded with MS tubular frame insert, upholstered with fabric and has a plastic back cover. The Insert is as tubular frame made of dia 1.9 +/- 0.02cm x 0.16 +/- 0.013cm thick M.S.E.R.W round tube with flexible support straps running across the length and width of the frame. Approx back size: 45.5cm(W) x 70.4cm (H).   |     |      |          |          |                  |                      |
|             |             | 3) Fabric: Chair to be upholstered with fabric of approved shade and colour. (The Fabric shall be inherent fire fabric with a base rate of Rs 700 per Rmt)   |     |      |          |          |                  |                      |
|             |             | High Resilience Polyurethane foam: The HR polyurethane foam is moulded with the density of 45 +/- 3 Kg/m3.   |     |      |          |          |                  |                      |
|             |             | Side Panels / Aisle Panel: The Chair rests on the ground on two side panel frames fabricated from 0.12 +/- 0.020cm thick CR steel sheet which is clad with fabric upholstery. The side panels frame is grouted to the floor using 2 nos if anchors for each through 0.3 + /- 0.05cm thick HR steel base plate.   |     |      |          |          |                  |                      |
|             |             | <b>Sub-total (Acoustical Works)</b>  |     |      |          |          | -                | <b>42,887,741.19</b> |
| <b>11.0</b> | <b>12.0</b> | <b>ROOFING WORK</b>  |     |      |          |          |                  |                      |
| 11.1        |             | Providing and fixing false ceiling at all height including frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27mm and 37mm, at 1200mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, |     |      |          |          |                  |                      |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|--------|------|----------|----------|------------------|------------------|
|        |         | including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with |        |      |          |          |                  |                  |
| 11.1.1 | 12.45.3 | 12.5 mm thick tapered edge gypsum moisture resistant board  | 35,373 | Sqm  | 958.65   |          | 33,910,326.45    | -                |
| 11.2   | 12.53   | Providing and Fixing 15mm thick densified tegular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x 600 mm panel to from grid of size 600x600 mm,  |        |      |          |          |                  |                  |
|        |         | resting on periphery walls /partitions on a Perimeter wall angle pre-coated steel of size(24x24X3000 mm made of 0.40 mm thick (minimum) sheet with the help of rawl plugs at 450 mm centre to centre with 25mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calicum silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening"for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main 'T', bottom exposed with 24mm of all T sections shall be pre-painted with polyster baked paint, for all heights, as per specifications, drawings and as directed by Engineer-in-Charge.               |        |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description   | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|--------|------|----------|----------|------------------|------------------|
|        |         | Note :- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tile shall have NRC value of 0.50 (Minimum), light reflection > 85%, non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity <0.043 w/mK.  | 5,365  | Sqm  | 1,497.90 |          | 8,036,233.50     | -                |
| 11.3   |         | Providing and fixing mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance > 85%, Thermal Conductivity k = 0.052 - 0.057 w/m K, Fire Performance as per (BS 476 pt - 6 & 7) in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm ) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel item (galvanised @80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod upto 1000mm length and L-shape level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls /partitions with the help of GI perimeter wall angle of size 24x24x3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T-sections used in false ceiling support system shall be prepainted with polyester baked paint, for all heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge. |        |      |          |          |                  |                  |
| 11.3.1 | 26.27.1 | With 16 mm thick beveled tegular mineral fibre false ceiling tile (NRC 0.55 to 0.6)  | 13,978 | Sqm  | 1,535.00 |          | 21,456,230.00    | -                |
| 11.3.2 | 26.27.3 | With 16 mm thick beveled tegular mineral fibre Antimicrobial false ceiling tile  | 49,915 | Sqm  | 1,621.60 |          | 80,942,164.00    | -                |
| 11.4   | NSR     | Supply, design and fixing of ZIPLOCK STANDING SEAM ALUMINIUM ROOFING SYSTEM IN 0.9mm thick AA 3004 ALUMINIUM ALLOY. OF approved brand The general roof-construction shall comprise from bottom to top as per details below:  | 1,100  | Sqm  |          | 7,153.00 | -                | 7,868,300.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No     | Item Description   | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items      | Amount NSR Items    |
|-------------|-------------|--|---------|------|----------|----------|-----------------------|---------------------|
|             |             | Steel Liner - 35/200 Galvanised steel liner sheet, 0.7 mm thk; 1000 mm total cover width x 35mm deep ribs spanning up to 2000mm centres(multiple spans) . The substrate is hot dipped galvanised steel coil ZM 275 coating class-minimum spangle conforming to NZS 3441:1978 or equivalent. Pre-treatment is a corrosion resistant chromate conversion coating. The primer is a corrosion inhibitive chromate primer, nominal thickness of 5µm plus/minus 1µm. The finish to the exposed surface of the liner will be polyester coating with a nominal film thickness of 23µm plus / minus 2µm. Top Hat – 20mm Top Hat along with brackets made of galvanised steel Vapour Control Layer – A single layer of double-sided aluminium foil / Polyethylene Film.<br>Clips – Polyamide reinforced E-100 clips to be used. Insulation - A layer of Glasswool insulation of 150mm compressed to 130mm thickness and minimum 24kg/m <sup>3</sup> density with thermal conductivity of K=0.033 W/mk at 25 degree Celsius. Fire classification with test procedures to BS 476: Parts 6 & 7. |         |      |          |          |                       |                     |
|             |             | Top layer – 65/400 profiled sheeting manufactured from Aluminium Alloy Almg1- as specified in DIN 1725 (comparable AA 3004), minimum material thickness of 0.9 mm PVDF / EMBOSSSED finish (as approved)<br>The material properties are as follows: -<br>Ultimate tensile strength: minimum 200 N/mm <sup>2</sup> 0.2% Proof Stress: minimum 185 N/mm <sup>2</sup> Modulus of elasticity:70,000 N/mm <sup>2</sup> Including Accessories, Fasteners and E- clips and 20mm Top-hat.<br>The roofing system shall be certified with a British Board of Agreement Certificate No 98/3481 plus the Institute of Bautechnik Zulassungbeschild NR-14.1.181 The approved roofing system must also be certified by the Factory Mutual FM Research Corporation of the USA and classified as a CLASS 1 Panel Roof. The manufacturer must produce all 3 valid certifications. Or any other equivalent matching certification.  |         |      |          |          |                       |                     |
|             |             | The fabricator to get shop drawings approved by engineer-in-charge before adoption on site.  |         |      |          |          |                       |                     |
|             |             | <b>Sub-total (Roofing Works)</b>   |         |      |          |          | <b>144,344,953.95</b> | <b>7,868,300.00</b> |
| <b>12.0</b> | <b>13.0</b> | <b>FINISHING WORK</b>  |         |      |          |          |                       |                     |
| 12.1        |             | 12mm cement plaster of mix :   |         |      |          |          |                       |                     |
| 12.1.1      | 13.1.2      | 1:6 (1 cement: 6 fine sand)  | 151,934 | Sqm  | 160.35   |          | 24,362,616.90         | -                   |
| 12.2        |             | 15mm cement plaster :  |         |      |          |          |                       |                     |
| 12.2.1      | 13.2.2      | 1:6 (1 cement: 6 fine sand)  | 145,121 | Sqm  | 185.20   |          | 26,876,409.20         | -                   |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No   | Code No | Item Description  | Qty     | Unit                                   | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------|---------|---|---------|--|----------|----------|------------------|------------------|
| 12.3    |         | 20mm cement plaster of mix :  |         |  |          |          |                  |                  |
| 12.3.1  | 13.3.1  | 1:4 (1 cement: 4 fine sand)   | 71,125  | Sqm                                    | 240.15   |          | 17,080,668.75    | -                |
| 12.4    |         | 6mm cement plaster of mix   |         |  |          |          |                  |                  |
| 12.4.1  | 13.16.1 | 1:3 (1 cement : 3 fine sand)  | 30,806  | Sqm                                    | 143.80   |          | 4,429,902.80     | -                |
| 12.5    | 13.22   | Extra for plastering exterior walls of height more than 10m from ground level for every additional height of 3m or part thereof.  | 40,415  | Sqm                                    | 40.65    |          | 1,642,869.75     | -                |
| 12.6    | 13.21   | Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers  | 10,688  | per bag of 50kg cement used in the mix | 50.35    |          | 538,140.80       | -                |
| 12.7    | 13.26   | Providing and applying plaster of paris putty of 2mm thickness over plastered surface to prepare the surface even and smooth complete.  | 272,143 | Sqm                                    | 118.70   |          | 32,303,374.10    | -                |
| 12.8    | 13.37   | White washing with lime to give an even shade   |         |  |          |          |                  |                  |
| 12.8.1  | 13.37.1 | New work (three or more coats)  | 171,905 | Sqm                                    | 17.25    |          | 2,965,361.25     | -                |
| 12.9    | 13.45   | Finishing walls with textured exterior paint of required shade  |         |  |          |          |                  |                  |
| 12.9.1  | 13.45.1 | New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/10 sqm   | 7,112   | Sqm                                    | 150.65   |          | 1,071,422.80     | -                |
| 12.1    |         | Finishing walls with Acrylic Smooth exterior paint of required shade  |         |  |          |          |                  |                  |
| 12.10.1 | 13.46.1 | New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)   | 14,226  | Sqm                                    | 96.05    |          | 1,366,407.30     | -                |
| 12.11   | 13.78   | Providing and applying 12mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part - 1 & II) 1976, applied on hacked / uneven background such as bare brick/ block/ RCC work on walls & ceiling at all floors and locations, finished in smooth line and level etc. complete. | 5,442   | Sqm                                    | 217.35   |          | 1,182,818.70     | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No   | Code No      | Item Description   | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------|--------------|--|---------|------|----------|----------|------------------|------------------|
| 12.12   |              | Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.  |         |      |          |          |                  |                  |
| 12.12.1 | 13.83.2      | Two coats  | 272,143 | Sqm  | 71.00    |          | 19,322,153.00    | -                |
| 12.13   |              | Painting with synthetic enamel paint, having VOC (Volatile Organic Compound) content less than 150 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.  |         |      |          |          |                  |                  |
| 12.13.1 | 13.84.2      | Two coats  | 5,700   | Sqm  | 75.00    |          | 427,500.00       | -                |
| 12.14   | 14.70        | Polishing on wood work with Melamine polishing of approved brand and manufacture two or more coat on new work.   | 245     | Sqm  | 79.50    |          | 19,477.50        | -                |
| 12.15   |              | Distemping with 1st quality acrylic distemper, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required, to achieve even shade and colour.   |         |      |          |          |                  |                  |
| 12.15.1 | 13.81.2      | Two coats  | 3,038   | Sqm  | 49.65    |          | 150,836.70       | -                |
| 12.16   | Based on DSR | Providing and fixing 150 mm wide, 22 gauge and 18mm square chicken wiremesh at junctions of concrete and brick work and other locations at all heights placed symmetrically on the joint, including cutting to required size, fixing in position with cement and nails etc complete in all respects as per specifications / drawings and to the entire satisfaction of the Engineer in Charge. | 6,865   | Sqm  | 90.00    |          | 617,850.00       | -                |
| 12.17   |              | Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface   |         |      |          |          |                  |                  |
| 12.17.1 | 13.43.1      | Water thinnable cement primer  | 275,181 | Sqm  | 36.95    |          | 10,167,937.95    | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| <b>S. No</b> | <b>Code No</b> | <b>Item Description</b>  | <b>Qty</b> | <b>Unit</b> | <b>DSR Rate</b> | <b>NSR Rate</b> | <b>Amount DSR Items</b> | <b>Amount NSR Items</b> |
|--------------|----------------|--|------------|-------------|-----------------|-----------------|-------------------------|-------------------------|
| 12.18        | NSR            | <p>PU Wall COATING</p> <p>Preparing the wall using sand paper cleaning etc. Providing and applying epoxy / acrylic wall putty over prepared wall surfaces to achieve smooth surface to take wall coating.</p> <p>Providing and applying water dispersed polyurethane wall coating of approved quality in 2 coats and finishing as per manufacturer specifications. A chemical resistant pre-packed, two part water dispersed polyurethane wall coating The total dry film thickness shall not be less than 90 microns in two coats. The cured film shall be hygienic and provide hard, flexible matt and chemical resistant surface.</p> | 2,700      | Sqm         |                 | 702.00          | -                       | 1,895,400.00            |
|              |                | <b>Sub-total (Finishing Works)</b>   |            |             |                 |                 | <b>144,525,747.50</b>   | <b>1,895,400.00</b>     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No     | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-------------|--|-------|------|----------|----------|------------------|------------------|
| <b>13.0</b> | <b>22.0</b> | <b>WATERPROOFING WORK</b>  |       |      |          |          |                  |                  |
| 13.1        | NSR         | <p><b>WET AREA WATERPROOFING</b></p> <p>Providing and sealing pipe penetrations by cementitious grout with epoxy bond compound of approved brand &amp; manufacture, as per manufacturer specification.</p> <p>Providing and applying two coats of acrylic polymer modified cementitious water proof coating of approved brand &amp; manufacture which shall contain a liquid polymer component and a cementitious powder components which shall be mixed as per manufacturer's instruction and applied over prepared concrete /masonry surface strictly maintaining the coverage specified by the manufacturer. Coating shall have Adhesion to concrete greater than 1 n/mm<sup>2</sup> and static crack accommodation of 1mm. Sprinkle coarse sand over final coat of coating when coating is still wet to facilitate in bonding with protection layer. The rate must include the cost of materials, labour for necessary surface preparation and application etc. complete.</p> <p>Providing &amp; laying of protective plaster 20 mm thick cement plaster 1:3(1 cement :3 coarse sand) admixed with integral waterproofing compound in recommended proportion coated surface. Surface area shall be measured for pavement.</p>  | 6,837 | Sqm  |          | 835.00   | -                | 5,708,895.00     |
| 13.2        |             | <p>Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations</p> <p>(a) Applying a slurry coat of neat cement using 2.75 kg/sqm of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300 mm height including cleaning the surface before treatment.</p> <p>(b) Laying brick bats with mortar using broken bricks/brick bats 25mm to 115 mm size with 50% of cement mortar 1:5 (1 cement : 5coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixedwith water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.</p> <p>(c) After two days of proper curing applying a second coat of cement slurry using 2.75 kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin-charge.</p> |       |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description   | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|--------|------|----------|----------|------------------|------------------|
|        |         | (d) Finishing the surface with 20mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3 mm deep.<br>(e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge  |        |      |          |          |                  |                  |
| 13.2.1 | 22.7.1  | With average thickness of 120 mm and minimum thickness at khurra as 65 mm.   | 57,979 | Sqm  | 1,034.65 |          | 59,987,972.35    | -                |
| 13.3   | 12.63   | Providing and applying two coats of High Albedo paint having minimum Solar Reflective Index (SRI) 108 (with solar reflectance & thermal emittance tested as per ASTM C 1549 and ASTM C 1371 respectively), VOC less than 10 cc/gm. The coating thickness and the methodology of application shall be strictly as per manufacturer's specifications and as approved by Engineer-In-Charge. Surface preparation includes cleaning with metal wire brush to remove all dust, fungus etc., washing with water all complete. The contractor shall give guarantee for the performance of SRI and also the durability of coating, all complete as per direction of Engineer-in-Charge.  | 51,384 | Sqm  | 254.65   |          | 13,084,935.60    | -                |
| 13.4   |         | Providing and laying water proofing treatment to Raft consisting of following operations inclusive of surface preparation as per manufactures specifications:  |        |      |          |          |                  |                  |
| 13.4.1 | NSR     | The waterproofing membrane shall be consisting of a blended polyethylene / polypropylene membrane incorporating a cell mesh, enabling the membrane to mechanically bond with the poured concrete. The membrane shall be supplied with one self-adhesive seldge to provide sealed laps and comply with British Standard 8102 2009 – Code of practice for "Protection of Structures Against Water from the Ground" to provide basement waterproofing protection to grades 1, 2 and 3. The product shall comply with the requirements of BS EN 13967:2004, Type A and Type T, "Flexible sheets for waterproofing- Plastic and rubber damp proof sheets including plastic and rubber basement tanking." The product shall have a current British Board of Agreement Certificate. | 2,350  | Sqm  |          | 1,696.00 | -                | 3,985,600.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No               | Item Description  | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items     |
|-------------|-----------------------|---|-------|-------|----------|----------|----------------------|----------------------|
| 13.5        |                       | Providing and laying water proofing treatment to Retaining Walls consisting of following operations inclusive of surface preparation as per manufactures specifications:  |       |       |          |          |                      |                      |
| 13.5.1      | NSR                   | Surface Preparation: remove all surface laitance and contamination free from loose aggregate or other sharp protrusions with fairly smooth finish by wire brush and grinding method and surface shall be DRY for application of single component pitch modified polyurethane cures by reaction with atmospheric moisture to give a tough elastomeric waterproof membrane.<br>System: Providing and applying 1.2mm thick roller applied single component Bitumen Modified Polyurathene coating, having elongation capability of 450% as per ASTM D412, having Tensile strength 1.5N/mm <sup>2</sup> as per ASTM D 412, Tear Resistance of 15N as per ASTM D 624 and having shore A Hardness 50 as per ASTM D 2240. Waterproofing treatment to be provided after proper surface preparation as per manufacturer specification.<br>Rate to be inclusive of Protection of waterproofing system with dimple board/ drainage board a per manufactures specifications and as approved by Engineer in Charge. | 3,896 | Sqm   |          | 1,272.00 | -                    | 4,955,712.00         |
| 13.6        | 22.26                 | Providing and applying of swellable type water stop tape, 19mm x 25mm thick in linear meter (expansive nature) for construction joints treatment of RCC structure, such as raft slab, retaining walls, water storage tank and at the junctions of raft slab with the retaining walls etc. After cleaning the surface, one coat of required primer for swellable water stop tape shall be applied throughout the length of the joint @3.78 litre per 240 running meter. Over the primed surface swellable type water stop tape shall be placed. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guaranteed for 10 years against any leakage.  | 779   | Meter | 538.90   |          | 419,803.10           | -                    |
|             |                       | <b>Sub-total (Waterproofing Works)</b>  |       |       |          |          | <b>73,492,711.05</b> | <b>14,650,207.00</b> |
| <b>14.0</b> | <b>21, 7 &amp; 25</b> | <b>ALUMINIUM, STRUCTURAL GLAZING AND FACADE WORK</b>  |       |       |          |          |                      |                      |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description  | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|---------|------|----------|----------|------------------|------------------|
| 14.1   |         | Providing and fixing dry cladding upto 10 metre heights with 30mm thick gang saw cut stone with (machine cut edges) of uniform colour and size upto 1mx1m, fixed to structural steel frame work and/ or with the help of cramps, pins etc. and sealing the joints with approved weather sealant as per Architectural drawing and direction of Engineer-in-charge.<br>(The steel frame work, stainless steel cramps and pins etc. shall be paid for separately).   |         |      |          |          |                  |                  |
| 14.1.1 | NSR     | 30mm thick (As per BS 8298) Finish - Honned. Basic Rate Rs. 3000 per Sqm (Basic Rate is F O R at site including the cost of polishing, honning etc but excluding GST)   | 53,829  | Sqm  |          | 5,470.00 | -                | 294,444,630.00   |
| 14.2   | 7.39    | Extra for stone work for wall lining on extrior walls of height more than 10m from ground level for every additional height of 3m or part there of.   | 93,777  | Sqm  | 85.90    |          | 8,055,444.30     | -                |
| 14.3   | 7.41    | Providing and fixing structural steel frame (for dry cladding) on walls at all heights using M.S. square / rectangular tube in the required pattern as per architectural drawing, including cost of cutting, bending, welding etc. The frame work shall be fixed to the wall with the help of M.S. brackets / lugs of angle iron / flats etc. which shall be welded to the frame and embedded in brick wall with cement concrete block 1:2:4 (1 cement:2 coarse sand:4 graded stone aggregate 20 mm nominal size) of size 300x230x300 mm, including cost of necessary centring and shuttering and with approved expansion hold fasteners on CC/RCC surface, including drilling necessary holes. Approved cramps / pins etc. shall be welded to the frame work to support stone cladding, the steel work will be given a priming coat of Zinc primer as approved by Engineer-in-charge and painted with two or more coats of epoxy paint (Shop drawings shall be submitted by the contractor to the Engineer-in-charge for approval before execution). The frame work shall be fixed in true horizontal & vertical lines/planes. (Only structural steel frame work shall be measured for the purpose of payment, stainless steel cramps shall be paid for separately and nothing extra shall be paid). | 608,002 | Kg   | 134.75   |          | 81,928,269.50    | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|---------|------|----------|----------|------------------|------------------|
| 14.4  | NSR     | Providing and fixing adjustable stainless steel cramps of approved quality, required shape and size, adjustable with stainless steel nuts, bolts and washer (total weight not less than 260 gms), for dry stone cladding fixed on frame work at suitable location, including making necessary recesses in stone slab, drilling required holes etc complete as per direction of the Engineer-in-charge.<br>Clamp body shall be of 304 grade wherein pin, externally threaded rod, internally threaded tube shall be of 316 grade. The (HC-SF-R) clamp body shall be of minimum 5mm thickness and shall be able to carry a dead load of 79.5 kgs at minimum offset. The clamp shall be available with variable offset lengths from 50-65mm and 80-120mm. Test certificate shall be submitted by the manufacturer. | 202,667 | Nos  |          | 393.00   | -                | 79,648,131.00    |
| 14.5  | 25.1    | Providing and supplying aluminium extruded tubular and other aluminium sections as per the architectural drawings and approved shop drawings , the aluminium quality as per grade 6063 T5 or T6 as per BS 1474,including super durable powder coating of 60-80 microns conforming to AAMA 2604 of required colour and shade as approved by the Engineer-in-Charge. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminium frame work. Nothing extra shall be paid on this account).   | 200,228 | Kg   | 338.25   |          | 67,727,121.00    | -                |
| 14.6  | 25.2    | Designing, fabricating, testing, protection, installing and fixing in position semi (grid) unitized system of structural glazing (with open joints) for linear as well as curvilinear portions of the building for all heights and all levels, including:   | 28,604  | Sqm  | 2,409.90 |          | 68,932,779.60    | -                |
|       |         | Structural analysis & design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)- cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation & drainage and protection against fire hazard including.   |         |      |          |          |                  |                  |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
|       |         | Fabricating and supplying serrated M.S. hot dip galvanised/ Aluminium alloy of 6005-T5 / 6061-T6 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimensional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC / masonry / structural steel framework of building structure using stainless steel anchor fasteners / bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers.   |     |      |          |          |                  |                  |
|       |         | Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment , including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass.   |     |      |          |          |                  |                  |
|       |         | Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight.  |     |      |          |          |                  |                  |
|       |         | Making provision for drainage of moisture/water that enters the semi(grid) unitized glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary holes of required sizes and of required numbers etc. complete.This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, T&P, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working structural glazing as specified, cleaning and protection till the handing over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as pecified, as per the approved shop drawings and as directed by the Engineer-in-Charge. |     |      |          |          |                  |                  |
|       |         | Note:- 1   |     |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
|       |         | The cost of providing extruded aluminium frames, shadow boxes, extruded aluminium section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this sub-head. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves ) on the external face shall be measured in sqm. up to two decimal places.  |     |      |          |          |                  |                  |
|       |         | Note:- 2   |     |      |          |          |                  |                  |
|       |         | The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accredited by NABL(National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable separately. The NIT approving authority will decide the necessity of testing on the basis of cost of the work, cost of the test and importance of the work. Performance Testing of Structural glazing system Tests to be conducted in the NBL Certified laboratories |     |      |          |          |                  |                  |
|       |         | (1) Performance Laboratory Test for Air Leakage Test (-50pa to - 300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr   |     |      |          |          |                  |                  |
|       |         | (2) Static Water Penetration Test. (50pa to 1500pa) as per ASTM E- 331-09 testing method for a range up to 2000 ml.  |     |      |          |          |                  |                  |
|       |         | (3) Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01- 05 testing method for a range upto 2000 ml  |     |      |          |          |                  |                  |
|       |         | (4) Structural Performance Deflection and deformation by static air pressure test (1.5 times desing wind pressure without any failure) as per ASTM E-330-10 testing method for a range upto 50 mm  |     |      |          |          |                  |                  |
|       |         | (5) Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09 testing method for Qualitative test. Tests to be conducted on site.  |     |      |          |          |                  |                  |
|       |         | (6) Onsite Test for Water Leakage for a pressure range 50 kpa to 240 kpa (35psi) upto 2000 ml  |     |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|--------|------|----------|----------|------------------|------------------|
| 14.7  | 25.3    | Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6 - 12 - 6mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade, an inner Heat strengthened clear float glass 6mm thick, spacer tube 12mm wide, dessicants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The IGUs shall be assembled in the factory/ workshop of the glass processor."(Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.26.2)"For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm." |        |      |          |          |                  |                  |
|       |         | (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Airgap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20%, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3W/m2 degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.  | 25,744 | Sqm  | 3,730.70 |          | 96,043,140.80    | -                |
| 14.8  | NSR     | Extra for Ceramic fritting of approved pattern, colour and quality on one side of inner glass of vision panel (IGUs). Area of Fritting on glass shall be measured for payment.  | 850    | Sqm  |          | 298.00   | -                | 253,300.00       |
| 14.9  | 25.4    | Extra for openable side / top hung vision glass panels (IGUs) including providing and supplying at site all accessories and hardwares for the openable panels as specified and of the approved make such as heavy duty stainless steel friction hinges, min 4 -point cremone locking sets with stainless steel plates, handles, buffers etc including necessary stainless steel screws/ fasteners, nuts, bolts, washers etc. all complete as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer- in-Charge.  | 7,297  | Sqm  | 2,941.60 |          | 21,464,855.20    | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 14.10 | 25.6    | Providing and supplying Spandrel Glass Panels comprising of 6mm thick heat strengthened monolithic float glass of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade so as to match the colour and shade of the IGUs in the vision panels etc. ,all complete for the required performances as specified, as per the Architectural drawings, as per the approved shop drawings, as specified, and as directed by the Engineer- in-Charge.“For payment, only the actual area of glass on face # 1 of the glass panels (but excluding the area of grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm. (Payment for fixing of Spandrel Glass Panels in the curtain glazing is included in cost of relevent Item*). (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20%, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement. | 256   | Sqm  | 2,798.70 |          | 716,467.20       | -                |
| 14.11 | 25.5    | Providing, fabricating and supplying shadow box of required size and shape, for fixing in the spandrel portion of the structural glazing, in linear as well as curvilinear portions of the building by providing semi -rigid, inorganic, non-combustible fibre glass wool insulation 50mm thick, conforming to IS: 8183 and BS: 3958 Part 5. The insulation layer shall have facing (factory bonded on surface # 10f the fibre glass insulation layer), of black non-woven fibre glass tissue of nominal thickness 0.5 mm and nominal mass not less than 60gm / sqm, made of randomly oriented glass fibres distributed in a binder by a wet-lay process including fixing 1.5 mm thick solid aluminum sheet backing using, 6 mm thick cement board including SS rivets, nuts, bolts, washers etc complete.   | 2,861 | Sqm  | 1,542.60 |          | 4,413,378.60     | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 14.12 | NSR     | Design, fabricate, test, certify, supply, installation, protection, cleaning and handover of metal cladding systems (Minimum 3mm thick solid aluminium sheet) to with stand a wind pressure not less than as mentioned in Technical specification & systems are to be fully prefabricated assembled units of minimum 3mm thick solid aluminium panels with folded returns, hooks, stiffeners, brackets and subframes (HDG and Aluminium) including interface details completed with factory finish and install on to site fixed channel and brackets. Includes interface details such as fire seal, flashing, sealants, extruded capping, interface works, brackets and any sub frame as required. Solid aluminium sheet panel to be Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron) in approved shade and color and of approved quality as per Engineer in charge. All design shall be done to meet the performance requirement mentioned in the technical specification. | 500   | Sqm  |          | 5,299.00 | -                | 2,649,500.00     |
| 14.13 | NSR     | Designing, Supply, installation and fixing of aluminum Corrugated Sheet 3mm thick, the panels shall be mechanically fixed to suitable substructure of Hot Dip Galvanised Mild Steel / aluminum at every Flange, at 120mm from the panel ends and a centre to centre distance as per site requirements taking into criteria the specific live loads and dead load. The Sheet shall be finished with Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron) of approved shade and colour as directed by Engineer in charge. Item to include, cost of accessories, edge profiles, fasteners, brackets, screws, fixtures etc. The design shall accommodate the building movement thermal expansion and the seismic movement the hot dip galvanised mild steel structure shall be of 2062 grade as per the is standards .It shall be treated with anti-corrosive coating and three coats of micaceous iron oxide of 100 microns each after shot blasting as per BS standards.          | 2,387 | Sqm  |          | 5,299.00 | -                | 12,648,713.00    |
| 14.14 | 25.7    | Designing, fabricating, testing, installing and fixing in position Curtain Wall with Aluminium Composite Panel Cladding, with open grooves for linear as well as curvilinear portions of the building , for all heights and all levels etc. including  | 500   | Sqm  | 3,405.90 |          | 1,702,950.00     | -                |
|       |         | Structural analysis & design and preparation of shop drawings for pressure equalisation or rain screen principle as required, proper drainage of water to make it watertight including checking of all the structural and functional design.   |       |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
|       |         | Providing, fabricating and supplying and fixing panels of aluminium composite panel cladding in pan shape in metallic colour of approved shades made out of 4mm thick aluminium composite panel material consisting of 3mm thick FR grade mineral core sandwiched between two Aluminium sheets (each 0.5mm thick). The aluminium composite panel cladding sheet shall be coil coated, with Kynar 500 based PVDF / Lumiflon based fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc  |     |      |          |          |                  |                  |
|       |         | The fastening brackets of Aluminium alloy 6005 T5 / MS with Hot Dip Galvanised with serrations and serrated washers to arrest the wind load movement, fasteners, SS 316 Pins and anchor bolts of approved make in SS 316, Nylon separators to prevent bi-metallic contacts all complete required to perform as per specification and drawing The item includes cost of all material & labour component, the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working curtain wall with aluminium composite panel cladding, cleaning and protection of the curtain wall with aluminium composite panel cladding till the handing over of the building for occupation. Base frame work for ACP cladding is payable under the relevant aluminium items. The Contractor shall provide curtain wall with aluminium composite panel cladding, having all the performance characteristics all complete , as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge. However, for the purpose of payment, only the actual area on the external face of the curtain wall with Aluminum Composite Panel Cladding (including width of groove) shall be measured in sqm. up to two decimal places." |     |      |          |          |                  |                  |
|       |         |   |     |      |          |          |                  |                  |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| <b>S. No</b> | <b>Code No</b> | <b>Item Description</b>  | <b>Qty</b> | <b>Unit</b> | <b>DSR Rate</b> | <b>NSR Rate</b> | <b>Amount DSR Items</b> | <b>Amount NSR Items</b> |
|--------------|----------------|--|------------|-------------|-----------------|-----------------|-------------------------|-------------------------|
| 14.15        | NSR            | Providing and fixing aluminium work for sunshades over existing facade system with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make. The aluminium quality as per grade 6063 T5 or T6 as per BS 1474, including super durable powder coating of 60 to 80 micron conforming to AAMA 2604 of required colour and shade as approved by Engineer in charge, fixing with necessary nuts bolts/ dash fasteners of required dia and size, including. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle all complete as per architectural/ shop drawings and the directions of Engineer-in-charge. The cost to include all materials, labour, T&P, scaffoldig etc to carry out the work at all heights. Weight of aluminium fixed at site shall be measured for payment. | 32,202     | Kg          |                 | 390.00          | -                       | 12,558,780.00           |
|              |                | <b>Sub-total (Aluminium, Structural Glazing and Façade Works)</b>  |            |             |                 |                 | <b>350,984,406.20</b>   | <b>402,203,054.00</b>   |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No     | Item Description   | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-------------|--|---------|------|----------|----------|------------------|------------------|
| <b>15.0</b> | <b>16.0</b> | <b>ROAD WORK</b>   |         |      |          |          |                  |                  |
| 15.1        | 16.1        | Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.   | 140,056 | Sqm  | 90.10    |          | 12,619,045.60    | -                |
| 15.2        | 16.78.1     | Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30 | 46,919  | Cum  | 2,089.70 |          | 98,046,634.30    | -                |
| 15.3        | 16.79       | Providing, laying, spreading and compacting graded stone aggregate (size range 53 mm to 0.075 mm ) to wet mix macadam (WMM) specification including premixing the material with water at OMC in for all leads & lifts, laying in uniform layers with mechanical paverfinisher in sub- base / base course on well prepared surface and compacting with vibratory roller of 8 to 10 tonne capacity to achievethe desired density, complete as per specifications and directions of Engineer-in-Charge.   | 18,129  | Cum  | 2,132.25 |          | 38,655,560.25    | -                |
| 15.4        |             | Providing and applying tack coat with bitumen of grade VG-10   |         |      |          |          |                  |                  |
| 15.4.1      | 16.30.2     | On bituminous surface @ 0.50 Kg l sqm  | 72,514  | Sqm  | 27.50    |          | 1,994,135.00     | -                |
| 15.5        |             | Providing and laying Dense Graded Bituminous Macadam using crushed stone aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site by tippers, laying with paver finisher equipped with electronic sensor to the required grade, level and alignment and rolling with smooth wheeled, vibratory and tandem rollers as per specifications to achieve the desired compaction and density, complete as per specificatons and directions of Engineer-in-Charge.                                   |         |      |          |          |                  |                  |
| 15.5.1      | 16.54.1     | 50 to 100mm average compacted thickness with bitumen of grade VG-30 @ 5% (percentage by weight of total mix) and lime filler @ 2% (percentage by weight of Aggregate) prepared in Batch Type Hot Mix Plant of 100-120 TPH capacity.  | 1,088   | Cum  | 7,247.70 |          | 7,885,497.60     | -                |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No  | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|--------|------|----------|----------|------------------|------------------|
| 15.6   |         | Providing and laying Bituminous concrete using crushed stone aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site by tippers, laying with paver finisher equipped with electronic sensor to the required grade, level and alignment and rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction and density as per specification, complete and as per directions of Engineer-in-Charge.   |        |      |          |          |                  |                  |
| 15.6.1 | 16.57.1 | 40/50mm compacted thickness with bitumen of grade VG-30 @ 5.5% (percentage by weight of total mix) and lime filler @ 3% (percentage by weight of Aggregate) and waste plastic additive @ 8% (percentage by weight of bitumen) prepared in Batch Type Hot Mix Plant of 100-120 TPH capacity.   | 972    | Cum  | 7,863.85 |          | 7,643,662.20     | -                |
| 15.7   | 16.63   | Providing, laying and making kerb channel 30 cm wide and 50 mm thick with cement concrete 1:3:6 (1 cement: 3 coarse sand:6 graded stone aggregate 20 mm nominal size) over 75mm bed of dry brick ballast 40 mm nominal size, well rammed and consolidate and grouted with fine sand, including finishing the top smooth etc. Complete and as per direction of Engineer-in-charge.   | 2,848  | Sqm  | 382.05   |          | 1,088,078.40     | -                |
| 15.8   |         | Providing and laying factory made chamfered edge Cement Concrete paver blocks In foot path, park & lawns driveway or light & traffic parking etc. of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of course sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand, all complete as per manufacturer's specifications & direction of Engineer-in-Charge. |        |      |          |          |                  |                  |
| 15.8.1 | 16.91.1 | 60mm thick Cement concrete paver block of M-35 grade with approved colour, design & pattern.  | 38,288 | Sqm  | 756.15   |          | 28,951,471.20    | -                |
| 15.8.2 | 16.91.2 | 80mm thick Cement concrete paver block of M-30 grade with approved colour, design & pattern.  | 13,136 | Sqm  | 638.95   |          | 8,393,247.20     | -                |
| 15.9   | 11.45   | Providing and laying 500mm x 500mm x 40mm thick Turf paver (Turf pave XD) on 150 mm thick sub grade of compacted bed of 20 mm thick nominal size stone aggregate and base course and filling with 150mm thick zone V sand, including spreading, well ramming, consolidating and finishing smooth etc. all complete as per direction of Engineer-in-charge.  | 26,271 | Sqm  | 1,113.20 |          | 29,244,877.20    | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|------|----------|----------|------------------|------------------|
| 15.10 | 16.69   | Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-charge).   | 1,312 | Cum  | 5,012.65 |          | 6,576,596.80     | -                |
| 15.11 | 16.62   | Providing and applying 2.5mm thick road marking strips (retro-reflective) of specified shade/ colour using hot thermoplastic material by fully/ semi automatic thermoplastic paint applicator machine fitted with profile shoe, glass beads dispenser, propane tank heater and profile shoe heater, driven by experienced operator on road surface including cost of material, labour, T&P, cleaning the road surface of all dirt, seals, oil, grease and foreign material etc. complete as per direction of Engineer-in-charge and accordance with applicable specifications.  | 8,380 | Sqm  | 391.25   |          | 3,278,675.00     | -                |
| 15.12 | 16.90   | Providing and laying tactile tile (for vision impaired persons as per standards) of size 300x300x9.8mm having water absorption less than 0.5% and conforming to IS: 15622, of approved make in all colours and shades in outdoor floors such as footpath, court yard, multi modals location etc., laid on 20mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) in all shapes & patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction of Engineer-in-Charge.   | 1,709 | Sqm  | 1,450.45 |          | 2,478,819.05     | -                |
| 15.13 | 16.80   | Construction of dry lean cement concrete sub base over a prepared sub-grade with coarse and fine aggregate conforming to IS:383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per specifications, cement content not to be less than 150 Kg/cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, for all leads & lifts, laid with a mechanical paver, compacting with 8-10 tonne vibratory roller, finishing and curing etc. complete as per direction of Engineer in-charge. | 1,266 | Cum  | 3,331.95 |          | 4,218,248.70     | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No   | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items      | Amount NSR Items |
|---------|---------|--|-------|------|----------|----------|-----------------------|------------------|
| 15.14   | 23.6    | Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.   | 100   | Cum  | 1,038.05 |          | 103,805.00            | -                |
| 15.15   |         | Providing and laying design mix cement concrete of M-30 grade, in roads/ taxi tracks/ runways, using cement content as per design mix, using coarse sand and graded stone aggregate of 40 mm nominal size in appropriate proportions as per approved & specified design criteria, providing dowel bars with sleeve/ tie bars wherever required, laying at site, spreading and compacting mechanically by using needle and surface vibrators, levelling to required slope/ camber, finishing with required texture, including steel form work with sturdy M.S. channel sections, curing, making provision for contraction/ expansion, construction & longitudinal joints ( 10 mm wide x 50 mm deep) by groove cutting machine, providing and filling joints with approved joint filler and sealants, complete all as per direction of Engineer-in-charge (Item of joint fillers, sealants, dowel bars with sleeve/ tie bars to be paid separately). |       |      |          |          |                       |                  |
| 15.15.1 | 16.43.1 | Cement concrete prepared with batch mixing machine   | 766   | Cum  | 6,893.25 |          | 5,280,229.50          | -                |
| 15.16   |         | Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge.   |       |      |          |          |                       |                  |
| 15.16.1 | 16.70.1 | Made of G.I. wire of dia 4 mm  | 1,800 | Sqm  | 561.70   |          | 1,011,060.00          | -                |
|         |         | <b>Sub-total (Roads)</b>   |       |      |          |          | <b>257,469,643.00</b> | <b>-</b>         |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No | Item Description  | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|--------|------|----------|----------|------------------|------------------|
| <b>16.0</b> |         | <b>HORTICULTURE</b>   |        |      |          |          |                  |                  |
| 16.1        | 2.1     | Trenching in ordinary soil up to a depth of 60 cm including removal and stacking of serviceable materials and then disposing of surplus soil, by spreading and neatly leveling within a lead of 50 m and making up the trenched area to proper levels by filling with earth or earth mixed with sludge or / and manure before and after flooding trench with water (excluding cost of imported earth, sludge or manure).  | 38,740 | Cum  | 45.85    |          | 1,776,229.00     | -                |
| 16.2        |         | Supplying and stacking at site dump manure from approved source, including carriage upto 5 km complete (manure measured in stacks will be reduced by 8% for payment)  |        |      |          |          |                  |                  |
| 16.2.1      | 2.4.2   | Screened through sieve of I.S. designation 16 mm  | 5,090  | Cum  | 192.05   |          | 977,534.50       | -                |
| 16.2.2      | 2.4.3   | Screened through sieve of I.S. designation 4.75 mm  | 3,079  | Cum  | 209.15   |          | 643,972.85       | -                |
| 16.3        | 2.6     | Uprooting weeds from the trenched area after 10 to 15 days of its flooding with water including disposal of uprooted vegetation.  | 64,567 | Sqm  | 2.90     |          | 187,244.30       | -                |
| 16.4        | 2.7     | Fine dressing of the ground.  | 32,284 | Sqm  | 2.15     |          | 69,410.60        | -                |
| 16.5        | 2.5     | Rough dressing the trenched ground including breaking clods.  | 32,284 | Sqm  | 0.90     |          | 29,055.60        | -                |
| 16.6        | 2.8     | Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge, dump manure and/ or good earth to be paid separately).  | 8,169  | Cum  | 30.95    |          | 252,830.55       | -                |
| 16.7        | 2.13    | Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20%: one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately) | 3,874  | Cum  | 130.35   |          | 504,975.90       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No   | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-------|------|----------|----------|------------------|------------------|
| 16.8    |         | Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) : |       |      |          |          |                  |                  |
| 16.8.1  | 2.14.1  | Holes 1.2 m dia and 1.2 m deep  | 4,892 | Each | 236.75   |          | 1,158,181.00     | -                |
|         |         |   |       |      |          |          | -                | -                |
| 16.9    | 2.25    | Supplying and stacking of well decayed cattle manure at site including royalty and carriage upto 5 k.m. lead complete (cattle manure measured in stacks will reduced by 8% for Payment).  | 566   | Cum  | 189.10   |          | 107,030.60       | -                |
| 16.10   |         | <b>Providing and displaying of Plants, Shurbs</b> , straight, well developed, fresh and healthy with lush green leaves from bottom to top in 25 cm size of Earthen pot / Plastic pot & as per direction of the officer-in-charge  |       |      |          |          |                  |                  |
| 16.10.1 | 7.1     | Acacia auriculiformis<br>Common name:<br>Height:150-165cm<br>Poly bag size:25cm   | 100   | Each | 60.00    |          | 6,000.00         | -                |
| 16.10.2 | 7.2     | Adansonia digitata<br>Common name: Kalpvruksha<br>Poly bag size:25cm  | 50    | Each | 250.00   |          | 12,500.00        | -                |
| 16.10.3 | 7.4     | Alstonia scholaris<br>Height:150-165cm<br>Poly bag size:25cm  | 120   | Each | 60.00    |          | 7,200.00         | -                |
| 16.10.4 | 7.5     | Azardirachta indica<br>Common name: Neem<br>Height:150-165cm<br>Poly bag size:25cm  | 200   | Each | 60.00    |          | 12,000.00        | -                |
| 16.10.5 | 8.1     | Bahunia acuminata<br>Height:60-75cm<br>Poly bag size:25cm   | 25    | Each | 45.00    |          | 1,125.00         | -                |
| 16.10.6 | 7.8     | Bahunia purpurea<br>Common name: Kachnar<br>Height:150-165cm<br>Poly bag size:25cm  | 100   | Each | 50.00    |          | 5,000.00         | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|---|-----|------|----------|----------|------------------|------------------|
| 16.10.7  | 7.13    | Butea monosperma<br>Common name:Flame of Forest<br>Height:60-75cm<br>Poly bag size:25cm | 125 | Each | 55.00    |          | 6,875.00         | -                |
| 16.10.8  | 7.16    | Cassia fistula<br>Common name:Amaltash<br>Height: 120-135cm<br>Poly bag size:25cm       | 100 | Each | 60.00    |          | 6,000.00         | -                |
| 16.10.9  | 7.18    | Cassia javanica<br>Common name:<br>Height:120-150cm<br>Poly bag size:25cm               | 100 | Each | 80.00    |          | 8,000.00         | -                |
| 16.10.10 | 7.17    | Cassia siamea<br>Height:150-165cm<br>Poly bag size:25cm                                 | 100 | Each | 60.00    |          | 6,000.00         | -                |
| 16.10.11 | 7.14    | Callistemon lanceolatus<br>Height:150-165cm<br>Poly bag size:25cm                       | 75  | Each | 60.00    |          | 4,500.00         | -                |
| 16.10.12 | 7.23    | Dalbergia sissoo<br>Common name:Seasam<br>Height:120-135cm<br>Poly bag size:25cm        | 75  | Each | 50.00    |          | 3,750.00         | -                |
| 16.10.13 | 7.24    | Delonix regia<br>Common name:Gulmohar<br>Height:150-165cm<br>Poly bag size:25cm         | 70  | Each | 60.00    |          | 4,200.00         | -                |
| 16.10.14 | 7.25    | Erythrina indica<br>Height:150-165cm<br>Poly bag size:25cm                              | 100 | Each | 60.00    |          | 6,000.00         | -                |
| 16.10.15 | 7.30    | Ficus bengalensis<br>Common name:Bargad<br>Height:120-135cm<br>Poly bag size:30cm       | 10  | Each | 60.00    |          | 600.00           | -                |
| 16.10.16 | 7.36    | Ficus religiosa<br>Common name:peepal<br>Height:150-165cm<br>Poly bag size:30cm         | 5   | Each | 60.00    |          | 300.00           | -                |
| 16.10.17 | 7.48    | Jacaranda Mimosifolia<br>Height:150-165cm<br>Poly bag size:25cm                         | 150 | Each | 60.00    |          | 9,000.00         | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|---|-----|------|----------|----------|------------------|------------------|
| 16.10.18 | 7.50    | Lagerstromea flosreginae<br>Height: 150-165cm<br>Poly bag size:25cm                         | 100 | Each | 120.00   |          | 12,000.00        | -                |
| 16.10.19 | 7.51    | Lagerstromea throlleia<br>Height: 150-165cm<br>Poly bag size:25cm                           | 100 | Each | 120.00   |          | 12,000.00        | -                |
| 16.10.20 | 7.53    | Mangnifera indica<br>Common name:(Mango grafted)<br>Height:60-75cm<br>Poly bag size:25cm    | 60  | Each | 55.00    |          | 3,300.00         | -                |
| 16.10.21 | 7.55    | Michelia champaca<br>Common name:(Golden champa)<br>Height:90-105cm<br>Poly bag size:25cm   | 75  | Each | 90.00    |          | 6,750.00         | -                |
| 16.10.22 | 7.56    | Millettia ovalifolia<br>Common name:<br>Height:120-135cm<br>Poly bag size:25cm              | 60  | Each | 50.00    |          | 3,000.00         | -                |
| 16.10.23 | 7.57    | Millingtonia hortensis<br>Common name:<br>Height: 150-165cm<br>Poly bag size:25cm           | 175 | Each | 70.00    |          | 12,250.00        | -                |
| 16.10.24 | 7.58    | Mimusops elengi<br>Common name:Maulsri<br>Height: 150-165cm<br>Poly bag size:25cm           | 200 | Each | 70.00    |          | 14,000.00        | -                |
| 16.10.25 | 7.60    | Cadamba<br>Common name:Kadamb<br>Height: 150-165cm<br>Poly bag size:25cm                    | 50  | Each | 60.00    |          | 3,000.00         | -                |
| 16.10.26 | 7.67    | Plumeria acutifolia<br>Height: 120-135cm<br>Branches:2-3<br>Poly bag size:30cm              | 50  | Each | 110.00   |          | 5,500.00         | -                |
| 16.10.27 | 7.72    | Plumeria rubra<br>Height: 120-150cm<br>Branches:3-4<br>Stem:Thick<br>Poly bag:HDPE big size | 75  | Each | 400.00   |          | 30,000.00        | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|--|-----|------|----------|----------|------------------|------------------|
| 16.10.28 | 7.62    | Peltophorum pterocarpum<br>Common name:<br>Height:150-165cm<br>Poly bag size:25cm  | 150 | Each | 60.00    |          | 9,000.00         | -                |
| 16.10.29 | 7.73    | Pongamia glabra<br>Common name:Papri<br>Height:120-135cm<br>Poly bag:25cm          | 80  | Each | 50.00    |          | 4,000.00         | -                |
| 16.10.30 | 7.74    | Polyalthia longifolia<br>Common name:Papri<br>Height:120-135cm<br>Poly bag:25cm    | 60  | Each | 80.00    |          | 4,800.00         | -                |
| 16.10.31 | 7.80    | Saraca indica<br>Common name:Sita Ashok<br>Height:150-120cm<br>Poly bag size:25cm  | 95  | Each | 80.00    |          | 7,600.00         | -                |
| 16.10.32 | 7.81    | Schleichera trijuga<br>Common name:Kusum<br>Height:150-165cm<br>Poly bag size:25cm | 100 | Each | 70.00    |          | 7,000.00         | -                |
| 16.10.33 | 7.82    | Spathodea campanulata<br>Height:150-165cm<br>Poly bag size:25cm                    | 145 | Each | 70.00    |          | 10,150.00        | -                |
| 16.10.34 | 7.85    | Tamarindus indica<br>Common name:Imli<br>Height:120-150cm<br>Poly bag size:25cm    | 100 | Each | 80.00    |          | 8,000.00         | -                |
| 16.10.35 | 7.88    | Terminalia arjuna<br>Common name:<br>Height:150-165cm<br>Poly bag size:25cm        | 120 | Each | 60.00    |          | 7,200.00         | -                |
| 16.10.36 | 8.72    | Thevetia neriifolia<br>Branches:5-6<br>Height:60-75cm<br>Poly bag size:25cm        | 100 | Each | 45.00    |          | 4,500.00         | -                |
| 16.10.37 | 5.30    | Foxtail palm<br>Height:120-150cm<br>Bottom girth:15-20cm<br>Poly bag size:25cm     | 150 | Each | 1,127.00 |          | 169,050.00       | -                |



**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|--|-------|------|----------|----------|------------------|------------------|
| 16.10.38 | 5.37    | Latania rubra palm<br>Height:150-180cm<br>Leaves:6-7<br>Poly bag size:30cm | 20    | Each | 512.50   |          | 10,250.00        | -                |
| 16.10.39 | 5.42    | Mascarena palm<br>Height:120-150cm<br>Leaves:Fresh and healthy             | 20    | Each | 461.25   |          | 9,225.00         | -                |
| 16.10.40 | 3.1     | Aglaonema Parrot<br>Leaves:Fresh and healthy<br>Height:30cm and above      | 703   | Each | 61.50    |          | 43,234.50        | -                |
| 16.10.41 | 9.1     | Allamanda cathartica<br>Leaves:Fresh and healthy<br>Height:30cm and above  | 494   | Each | 40.00    |          | 19,760.00        | -                |
| 16.10.42 | 10.1.1  | Alyssum<br>Leaves:Fresh and healthy<br>Height:30cm and above               | 1,486 | Each | 4.00     |          | 5,944.00         | -                |
| 16.10.43 | 6.1     | Alpinia Variegated<br>Leaves:Fresh and healthy<br>Height:30cm and above    | 1,553 | Each | 112.75   |          | 175,100.75       | -                |
| 16.10.44 | 3.14    | Areca palm<br>Leaves:Fresh and healthy<br>Height:90-1.2cm                  | 2,516 | Each | 143.50   |          | 361,046.00       | -                |
| 16.10.45 | 8.3     | Beloperone guttata<br>Common name:<br>Height:30-45cm<br>Poly bag size:25cm | 1,186 | Each | 40.00    |          | 47,440.00        | -                |
| 16.10.46 | 5.10    | Bird of paradise<br>Leaves:Fresh and healthy<br>Height:90-120cm            | 855   | Each | 389.50   |          | 333,022.50       | -                |
| 16.10.47 | 5.12    | Bougainvillea<br>Leaves:Fresh and healthy<br>Bushy<br>Height:75-90cm       | 370   | Each | 307.50   |          | 113,775.00       | -                |
| 16.10.48 | 8.4     | Caesalpinia pulcherrima<br>Leaves:Fresh and healthy<br>Height:45-60cm      | 795   | Each | 45.00    |          | 35,775.00        | -                |
| 16.10.49 | 8.5     | Calliandra emarginata<br>Leaves:Fresh and healthy<br>Height:45-60cm        | 259   | Each | 35.00    |          | 9,065.00         | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|--|-----|------|----------|----------|------------------|------------------|
| 16.10.50 | 8.13    | Cestrum nocturnum<br>Leaves:Fresh and healthy<br>Height:45-60cm                | 249 | Each | 40.00    |          | 9,960.00         | -                |
| 16.10.51 | 7.23    | Croton baby golden<br>Leaves:Fresh and healthy<br>Height:30cm and above        | 808 | Each | 36.90    |          | 29,815.20        | -                |
| 16.10.52 | 8.14    | Dombeya mastersii<br>Leaves:Fresh and healthy<br>Height:60-75cm                | 444 | Each | 110.00   |          | 48,840.00        | -                |
| 16.10.53 | 8.24    | Ficus panda<br>Branches:3-4<br>Height:30-45cm<br>Poly bag size:20cm            | 155 | Each | 30.00    |          | 4,650.00         | -                |
| 16.10.54 | 5.0     | Furcraea variegated<br>Foliage:Fresh and healthy<br>Leaves:8-10                | 12  | Each | 200.00   |          | 2,400.00         | -                |
| 16.10.55 |         | Gomphrena<br>Foliage:Fresh and healthy   | 185 | Each | 5.00     |          | 925.00           | -                |
| 16.10.56 | 8.28    | Gardenia jasminoides<br>Branches:3-4<br>Height:45-60cm<br>Poly bag size:20cm   | 793 | Each | 50.00    |          | 39,650.00        | -                |
| 16.10.57 |         | Hibiscus mutabilis<br>Branches:5-6<br>Height:60-75cm<br>Poly bag size:20cm     | 550 | Each | 40.00    |          | 22,000.00        | -                |
| 16.10.58 | 8.30    | Hamelia patens<br>Branches:3-4<br>Height:60-75cm<br>Poly bag size:20cm         | 232 | Each | 50.00    |          | 11,600.00        | -                |
| 16.10.59 | 8.34    | Hibiscus rosa sinensis<br>Branches:5-6<br>Height:60-75cm<br>Poly bag size:20cm | 550 | Each | 45.00    |          | 24,750.00        | -                |
| 16.10.60 | 8.40    | Jatropha<br>Branches:multibranch<br>Height:60-75cm<br>Poly bag size:20cm       | 446 | Each | 40.00    |          | 17,840.00        | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|---|-------|------|----------|----------|------------------|------------------|
| 16.10.61 | 8.44    | Murraya exotica<br>Branches:4-5<br>Height:45-60cm<br>Poly bag size:15cm                 | 860   | Each | 15.00    |          | 12,900.00        | -                |
| 16.10.62 | 8.46    | Mussaenda erythrophylla<br>Branches:multibranch<br>Height:60-75cm<br>Poly bag size:20cm | 977   | Each | 100.00   |          | 97,700.00        | -                |
| 16.10.63 | 3.62    | Philodendron sellum plant<br>Branches:5-6<br>Height:30-45cm                             | 222   | Each | 153.75   |          | 34,132.50        | -                |
| 16.10.64 | 6.23    | Schflera green<br>Branch:3-4<br>Height:30-40cm  | 1,482 | Each | 30.75    |          | 45,571.50        | -                |
| 16.10.65 | 3.69    | Raphis palm<br>Branches:5-6<br>Height:75-90cm   | 1,875 | Each | 461.00   |          | 864,375.00       | -                |
| 16.10.66 | 4.62    | Salvia<br>Branches:5-6<br>Height:45-60cm  | 185   | Each | 102.50   |          | 18,962.50        | -                |
| 16.10.67 | 3.40    | Song of India<br>Branches:4-5<br>Height:30-45cm<br>Poly bag size:25cm                   | 1,233 | Each | 41.00    |          | 50,553.00        | -                |
| 16.10.68 | 8.57    | Tabernaemontana coronaria<br>Branches:5-6<br>Height:75-90cm<br>Poly bag size:25cm       | 1,268 | Each | 45.00    |          | 57,060.00        | -                |
| 16.10.69 | 8.66    | Tecoma gaudichaudi<br>Branches:5-6<br>Height:75-90cm<br>Poly bag size:25cm              | 1,107 | Each | 50.00    |          | 55,350.00        | -                |
| 16.10.70 | 5.34    | Zamia palm<br>Leaves:Fresh and healthy<br>Height:90cm<br>Poly bag size:25cm             | 276   | Each | 922.50   |          | 254,610.00       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No    | Code No | Item Description   | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|--|--------|------|----------|----------|------------------|------------------|
| 16.11    |         | <b>Providing and Displaying of Ground Covers</b> , with fresh and healthy variegated foliage of Earthen Pot / Plastic Pot & as per direction of the officer-in-charge. |        |      |          |          |                  |                  |
| 16.11.1  | 6.5     | Aspidistra<br>Fresh and healthy<br>Leaves:10-15  | 6,791  | Each | 41.00    |          | 278,431.00       | -                |
| 16.11.2  | 6.4     | Asparagus sprengeri<br>Branch:Multibranch<br>Height:30-45cm  | 2,258  | Each | 20.50    |          | 46,289.00        | -                |
| 16.11.3  | 6.2     | Alternanthera<br>Branch:Multibranch<br>Height:30-45cm  | 9,539  | Each | 20.50    |          | 195,549.50       | -                |
| 16.11.4  | 6.8     | Chlorophytum green<br>Leaves:Fresh and healthy   | 5,436  | Each | 20.50    |          | 111,438.00       | -                |
| 16.11.5  | 6.9     | Chlorophytum-variegated<br>Leaves:Fresh and healthy  | 11,337 | Each | 20.50    |          | 232,408.50       | -                |
| 16.11.6  | 6.10    | Cuphea Chinesis<br>Foliage:healthy<br>Height:30-45cm   | 15,120 | Each | 20.50    |          | 309,960.00       | -                |
| 16.11.7  | 6.11    | Dianella variegated<br>Leaves:Fresh and healthy  | 20,754 | Each | 30.75    |          | 638,185.50       | -                |
| 16.11.8  | 6.15    | Ipomea golden leaves<br>Leaves:Fresh and healthy   | 7,823  | Each | 20.50    |          | 160,371.50       | -                |
| 16.11.9  | 6.17    | Iresine herbstii<br>Branches:Well developed<br>Height:20-30cm  | 12,148 | Each | 20.50    |          | 249,034.00       | -                |
| 16.11.10 | 6.19    | Ophiopogon green<br>Leaves:Fresh and healthy   | 4,370  | Each | 20.50    |          | 89,585.00        | -                |
| 16.11.11 | 6.19    | Ophiopogon black<br>Leaves:Fresh and healthy   | 5,570  | Each | 21.50    |          | 119,755.00       | -                |
| 16.11.12 | 6.24    | Setcrecea purpurea<br>Leaves:Fresh and healthy   | 3,722  | Each | 20.50    |          | 76,301.00        | -                |
| 16.11.13 | 6.26    | Syngonium golden<br>Height:30-45cm<br>Poly bag size:15cm   | 12,899 | Each | 30.75    |          | 396,644.25       | -                |
| 16.11.14 | 6.30    | Wadelia trilobata<br>Leaves:Healthy<br>Poly bag size:15cm  | 41,864 | Each | 15.40    |          | 644,705.60       | -                |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No       | Code No | Item Description  | Qty     | Unit | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items    |
|-------------|---------|---|---------|------|----------|----------|----------------------|---------------------|
| 16.11.15    | 6.31    | Zebrina trades cantia plant<br>Leaves:Fresh and healthy   | 2,810   | Each | 20.50    |          | 57,605.00            | -                   |
| 16.12       | 2.34    | Providing & laying Selection no. 1 grass turf with earth 50mm to 60mm thickness on existing ground prepared with proper level and ramming with required tools wooden and than rolling the surface with light roller make the surface smoothen and light watering the same, as per direction of officer in charge  | 28,510  | Sqm  | 77.00    |          | 2,195,270.00         | -                   |
| 16.13       |         | Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unserveiceable material's as per direction of officer in charge (excluding cast of plant & water)  |         |      |          |          |                      |                     |
| 16.13.1     | 2.57.1  | Trees Plant   | 3,597   | Each | 4.25     |          | 15,287.25            | -                   |
| 16.13.2     | 2.57.2  | Shrubs Plant  | 24,126  | Each | 2.15     |          | 51,870.90            | -                   |
| 16.13.3     | 2.57.3  | Hedge Plant   | 162,441 | Each | 1.40     |          | 227,417.40           | -                   |
| 16.14       | NSR     | Supply, fabrication and erection of 10mm thick clear multi wall solar control polycarbonate sheets of approved quality and shade in desired shape in roofing including the cost of EPDM gaskets, sealing tape, aluminium profile and all necessary accessories complete as per architectural drawings and as directed by Engineer incharge. The item includes designing the complete system and supplying & getting approved from client and / or reputed engineering institue like IIT etc. The detailed shop drawings including supplying structural design calculations based on relevent codal provisions and carrying out water penetration test as per standards followed in India. | 2,080   | Sqm  |          | 3,312.00 | -                    | 6,888,960.00        |
|             |         | The whole work is to be done through reputed and approved vendor having experience in polycarbonate work in Commercial / Govt / Corporate buildings as per architectural elevation drawings including filling of joints with silicon sealent and also with masonry / RCC work, at all heights including double heights, straight or curved etc. complete in all respect. (Surface Area shall be measured for the payment) (M.S. Framing to be paid for seprately)   |         |      |          |          |                      |                     |
|             |         | <b>Sub-total (Horticulture Works)</b>   |         |      |          |          | <b>15,102,005.75</b> | <b>6,888,960.00</b> |
| <b>17.0</b> |         | <b>SIGNAGES</b>   |         |      |          |          |                      |                     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty     | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|---------|------|----------|------------|------------------|------------------|
| 17.1  | NSR     | Providing and fixing External Signage's made of SS 316 (brush finish) 3mm thk. plate for Logo part and letters raised by powder coated with brand color with translit print. Including all fittings, accessories, fixtures, fabrication. The cost to include Scaffolding, required supports to fix signage on walls. The signage will be illuminated with approved LED's along with SMPS and timer fixed on the wall with necessary fixtures. Size: 8000mm x 1500mm   | 2       | Each |          | 563,325.00 | -                | 1,126,650.00     |
| 17.2  | NSR     | Providing and fixing of Sinages of varying sizes and shapes using stainless steel sheet (304 Grade) of minimum 16G thickness brush finish including lazer engraving / etching of letters / image of required size filled with colour as desired by engineer fixing with SS screws on walls.   | 400,000 | Sqcm |          | 2.98       | -                | 1,192,000.00     |
| 17.3  | NSR     | Providing & fixing of EDGELIT Signage with battery back up made from acrylic sheet of 8 mm thickness laser engraved, transformer to be inbuilt Maintenance-free sealed nickel cadmium battery including • 120V/277V AC Operation • Crystal clear acrylic • Engraved letters increase visibility Anodized aluminum faceplate • Field applied chevron directional indicators simplify installation • Energy-saving LED lamps • UL listed  | 100,000 | Sqcm |          | 6.08       | -                | 608,000.00       |
| 17.4  | NSR     | Providingb fabricating and fixing of LED Signages made from acrylic 2 sheets + L- D strips & power supply with the message print out and stainless steel studs on the walls including cost of screws and fixing complete as per directions of engineer.   | 135     | Sqcm |          | 28,017.21  | -                | 3,782,323.35     |
| 17.5  | NSR     | Providing. fabricating and fixing of ACP DUAL Sided TOWER ACP Signages with 3mm ACP Sheets using 25 X 25 mm MS pipe frame of approved quality with anti Rust coating All 4 Sides with ACP Sheet Alucobond or equivalent make) Lettering to be done with raised 25mm Acrylic letters made from 3mm acrylic sheet and Vinyl's (if Needed) backlit with Philips or equivalent approved Slim Lite Tube light - fittings Acrylic Letters to Protrude out and be litb including transportation and fixing at Site as per the direction of engineer in charge. All Acrylic used should be of Accast grade and vinyls of 3M quality - lectrical Philips - lectronic or equivalentb with timer for auto on and off | 50      | Sqcm |          | 25,036.66  | -                | 1,251,833.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|------|----------|----------|------------------|------------------|
| 17.6  | NSR     | Providing & Fixing Wall Mounted Nonlit Fire Exit 61cm x 23 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.               | 1,000 | Each |          | 1,967.17 | -                | 1,967,170.00     |
| 17.7  | NSR     | Providing & Fixing Suspended Nonlit sign 122x23 cm of approved make & made of 1" Aluminium framing duly PU painted and 10mm Acrylic element mounted to it from either side with the required text matters stuck on it with plotted Self Adhesive Vinyl bracketed at suitable locations, including necessary fittings & fastening etc. complete & as directed by The Engineer in charge. | 300   | Each |          | 6,199.55 | -                | 1,859,865.00     |
| 17.8  | NSR     | Providing & Fixing Wall Mounted Nonlit Utility 15x15 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.                     | 1,000 | Each |          | 357.67   | -                | 357,670.00       |
| 17.9  | NSR     | Providing & Fixing Wall Mounted Nonlit Identification sign 46x12.5 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.                     | 1,000 | Each |          | 888.21   | -                | 888,210.00       |
| 17.10 | NSR     | Providing & Fixing Wall Mounted Nonlit Utility 61x23 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.                     | 1,000 | Each |          | 1,967.17 | -                | 1,967,170.00     |

**ABSTRACT OF COST FOR CIVIL WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur – Andhra Pradesh.**

| S. No        | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items        | Amount NSR Items      |
|--------------|---------|---|-----|------|----------|-----------|-------------------------|-----------------------|
| 17.11        | NSR     | Providing & Fixing Wall Mounted Nonlit directory sign 305x122 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.  | 50  | Each |          | 73,917.74 | -                       | 3,695,887.00          |
| 17.12        | NSR     | Providing & Fixing Wall Mounted Nonlit directory sign 91x61 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.  | 50  | Each |          | 22,890.66 | -                       | 1,144,533.00          |
| 17.13        | NSR     | Providing and installation of SOLAR ROAD STUDS Self-Illuminating in dim Areas of during night time. Solar Rechargeable batteries for Continual Performance Without Much Maintained Super bright LEDs with a viewing Distance of 500-800 meters. Equipped with Prismatic reflective lens on each side ensure maximum reflectivity made up of highly compressive material, can sustain 10 tonnes. Water Resistant (Aluminum alloy and Polycarbonate 6 Led with stem )Self 20 green for entry and 20 Red for exit. | 500 | Each |          | 2,098.31  | -                       | 1,049,155.00          |
| 17.14        | NSR     | Providing and Installation of CAR STOPPER Color: Black with yellow Reflective Strip Feet With help of fasteners (2 reflectors on Each Stopper) L-500 MM H-100M B-125 MM Weight-4.8 Kg.  | 100 | Each |          | 1,049.16  | -                       | 104,916.00            |
| 17.15        | NSR     | Providing and installation of CAT EYE OF 3M QUALITY Designed to provide Enhanced, Dependable road Guidance to motorists, These are Visible From long Distance. These are installed With Special hot Melt Bitumen Adhesive Avoiding Nails ETC. (ABS Cat's Eye 90x110x17MM, Conforms ASTM Standards)  | 500 | Each |          | 387.47    | -                       | 193,735.00            |
|              |         | <b>Sub-total (Signages)</b>   |     |      |          |           | -                       | <b>21,189,117.35</b>  |
| <b>TOTAL</b> |         |   |     |      |          |           | <b>3,012,749,782.25</b> | <b>699,534,414.54</b> |



**Name of Work : Plumbing Works for Construction of hospital & Academic Campus of All India Institute of Medical Sciences (AIIMS) at Guntur.**

**MAIN ABSTRACT SHEET**

| <b>A</b>      | <b>PLUMBING WORKS</b>                                    |                        |                        |
|---------------|--|------------------------|------------------------|
| <b>Sr.No.</b> | <b>SUB - HEADS</b>                                       | <b>DSR Amount</b>      | <b>NSR Amount</b>      |
| <b>A</b>      | <b>INTERNAL PLUMBING</b>                                 |                        |                        |
| 1.00          | SANITARY FIXTURES  | 1,65,73,840.25         | 3,83,55,594.35         |
| 2.00          | SOIL, WASTE AND VENT PIPES                               | 2,81,06,016.45         | 2,65,84,409.00         |
| 3.00          | WATER SUPPLY   | 1,92,46,072.51         | 4,69,72,328.65         |
| 4.00          | SEWAGE & DRAINAGE (AROUND THE BUILDING)                  | 1,22,38,885.05         | 82,65,770.00           |
| 5.00          | SOLAR WATER HEATING SYSTEM                               | 4,15,587.65            | 2,49,55,354.00         |
| 6.00          | RAIN WATER PIPING  | 46,51,231.30           | 1,81,03,134.00         |
|               |  |                        |                        |
| <b>B</b>      | <b>EXTERNAL PLUMBING</b>                                 |                        |                        |
| 7.00          | EXTERNAL WATER SUPPLY                                    | 2,85,10,477.50         | 1,44,66,278.00         |
| 8.00          | BOREWELL   | 28,33,665.90           | 18,25,614.00           |
| 9.00          | RAIN WATER HARVESTING(12 Nos.)                           | 5,95,754.20            | 11,56,068.00           |
| 10.00         | EXTERNAL SEWERAGE AND DRAINAGE (Except Around Building ) | 2,78,43,428.95         | 1,05,00,848.47         |
| 11.00         | EARTH WORK   | 40,91,785.00           | 60,000.00              |
| 12.00         | WTP & PUMP ROOM WORKS                                    | -                      | 3,16,63,240.00         |
| 13.00         | EFFLUENT TREATMENT PLANT(ETP) -                          | -                      | 38,20,892.00           |
| 14.00         | SEWAGE TREATMENT PLANT                                   | -                      | 2,10,53,645.00         |
| 15.00         | ELECTRICAL INSTALLATION FOR PLUMBING SYSTEM              | -                      | 15,76,617.00           |
|               | <b>SUB TOTAL</b>   | <b>14,51,06,744.76</b> | <b>24,93,59,792.47</b> |
|               |  |                        |                        |
|               | <b>GRAND TOTAL (RS)</b>                                  | <b>39,44,66,537.00</b> |                        |

| ABSTRACT OF COST FOR PLUMBING WORKS   |   |      |      |          |          |              |            |
|---|---|------|------|----------|----------|--------------|------------|
| Name of Work : Plumbing Works for Construction of hospital & Academic Campus of All India Institute of Medical Sciences (AIIMS) at Guntur.                                |   |      |      |          |          |              |            |
| S. No   | Item Description  | Unit | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount |
| 1   | 2   | 3    | 4    | 5        | 6        | 7            | 8          |
| <b>Note: Based on the tender drawing the agency has to prepare the internal &amp; external plumbing shop drawing and obtain the approval of the same before execution</b> |   |      |      |          |          |              |            |
| <b>1.00</b>   | <b>SANITARY FIXTURES</b>  |      |      |          |          |              |            |
| 1.01  | Providing & fixing <b>water closet squatting pan( Indian W.C.Pan)</b> with 100 mm sand cast iron P or S strap,10 Litre low level white P.V.C flushing cistern with manually controled device(handle lever) conforming to IS:7231 with all fittings & fixture complete including cutting and making good the walls & floors wherever required.(Parryware model no. C0117 or other equivalent model as per approved make)   |      |      |          |          |              |            |
| a)  | White <b>vitreous china orissa pattern W.C.</b> pan of size 580 x 440 mm with integral type foot rests.   | Each | 60   | 3,494.20 |          | 2,09,652.00  | -          |
|   |   |      |      |          |          | -            | -          |
| 1.02  | Providing and fixing white vitreous china <b>Pedestal type water closet (European type)</b> with seat and lid, 10 litre low level white vitreous flushing cistern and C.P. flush bend with fittings & C.I. brackets, 40mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete including painting of fittings and brackets, cutting and making good the walls and floors wherever required:(Parryware model no. C0271 or other equivalent as per approved make |      |      |          |          | -            | -          |
| a)  | W.C. pan with ISI black solid plastic seat & lid.   | Each | 1080 | 4,570.50 |          | 49,36,140.00 | -          |
|   |   |      |      |          |          | -            | -          |
| 1.03  | Providing and fixing <b>wash basin with C.I. brackets, 15mm C.P. brass pillar taps,</b> 32mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever required:(Jaquar or other equivalent approved make.  |      |      |          |          | -            | -          |
| a)  | White Vitreous China Flat back wash basin size 550x 400 mm with single 15 mm C.P. brass pillar tap  | Each | 1440 | 1,817.35 |          | 26,16,984.00 | -          |
|   |   |      |      |          |          | -            | -          |
| 1.04  | Providing and fixing <b>wash basin</b> with C.I. brackets, 15 mm dia <b>CP Brass single hole basin mixer</b> of approved quality and make, including painting of fittings and brackets, cutting and making good the walls wherever required:- (a) White Vitreous China Wash basin size 550x400 mm with a 15 mm CP Brass single hole basin mixer. (Roca model no RT5A3127CA1 &RS325463 OR other equivalent model as per approved make  |      |      |          |          | -            | -          |
| a)  | White Vitreous China Wash basin size 550x400 mm with a 15 mm CP Brass single hole basin mixer   | Each | 270  | 2,984.20 |          | 8,05,734.00  | -          |
|   |   |      |      |          |          | -            | -          |
| 1.05  | Providing and fixing white vitreous china <b>pedestal for wash basin</b> completely recessed at the back for the reception of pipes and fittings.   | Each | 90   | 975.25   |          | 87,772.50    | -          |
|   |   |      |      |          |          | -            | -          |

| S. No  | Item Description   | Unit | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount |
|--------|--|------|------|----------|----------|--------------|------------|
| 1      | 2  | 3    | 4    | 5        | 6        | 7            | 8          |
| 1.06   | Providing and fixing Stainless Steel A ISi 304 (18/8) kitchen sink as per IS: 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required :  |      |      |          |          | -            | -          |
| a)     | <b>Kitchen sink with drain board</b>   |      |      |          |          | -            | -          |
| a.i)   | 510x1040 mm bowl depth 225 mm  | Each | 45   | 3,830.40 |          | 1,72,368.00  | -          |
| b)     | <b>Kitchen sink without drain board</b>  |      |      |          |          | -            | -          |
| b.ii.) | 610x460 mm bowl depth 200 mm   | Each | 10   | 2,186.25 |          | 21,862.50    | -          |
|        |  |      |      |          |          | -            | -          |
| 1.07   | Providing and fixing white vitreous china <b>laboratory sink</b> with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good the wall wherever required ( Parryware model no.C0602 or other equivalent model i.e, Jaquar & Hindware) |      |      |          |          | -            | -          |
| a)     | Size 450x300x150 mm  | Each | 926  | 3,211.45 |          | 29,73,802.70 | -          |
|        |  |      |      |          |          | -            | -          |
| 1.08   | Providing and fixing 8 mm dia <b>C.P. / S.S. Jet with flexible tube</b> upto 1 metre long with S.S. triangular plate to European type W.C. of quality and make as approved by Engineer - in -charge.code RF9061A1 From Roca or other equivalent make.  | Each | 1151 | 254.80   |          | 2,93,274.80  | -          |
|        |  |      |      |          |          | -            | -          |
| 1.09   | Providing and fixing CP Brass 32mm size <b>Bottle Trap</b> of approved quality & make and as per the direction of Engineerin- charge.RF 9066A1 From Roca or other equivalent make.   | Each | 1800 | 795.15   |          | 14,31,270.00 | -          |
|        |  |      |      |          |          | -            | -          |
| 1.10   | Providing and fixing <b>P.V.C. waste pipe for sink or wash basin</b> including P.V.C. waste fittings complete.   |      |      |          |          | -            | -          |
|        | Semi rigid pipe  |      |      |          |          | -            | -          |
| a)     | 32 mm dia  | Each | 100  | 75.60    |          | 7,560.00     | -          |
| b)     | 40 mm dia  | Each | 200  | 81.40    |          | 16,280.00    | -          |
|        |  |      |      |          |          | -            | -          |
|        |  |      |      |          |          | -            | -          |
| 1.11   | Providing and fixing <b>superior glass mirror</b> (of approved quality) and of required shape and size with plastic moulded frame of approved make and shape with 6 mm thick hard board backing.   |      |      |          |          | -            | -          |
| a)     | Rectangular shape 453x357 mm   | Each | 100  | 752.80   |          | 75,280.00    | -          |
| b)     | Rectangular shape 1500x450 mm  | Each | 100  | 1,323.10 |          | 1,32,310.00  | -          |
|        |  |      |      |          |          | -            | -          |
| 1.12   | Providing and fixing 600x120x5 mm <b>glass shelf</b> with edges round of supported and anodised aluminium angle frame with C.P. brass brackets and guard rail complete fixed with 40 mm long screws, rawl plugs etc., complete. Code no RA816708001 from Roca or othe equivalent make)   | Each | 128  | 573.30   |          | 73,382.40    | -          |
|        |  |      |      |          |          | -            | -          |
| 1.13   | Providing and fixing <b>toilet paper holder</b> . (Roca model no. or other equivalent model as per approved make) code RA816713001 from roca or other equivalent make  |      |      |          |          | -            | -          |
| a)     | C.P. brass   | Each | 881  | 385.35   |          | 3,39,493.35  | -          |

| S. No | Item Description   | Unit | Qty  | DSR Rate  | NSR Rate  | DSR Amount  | NSR Amount   |
|-------|--|------|------|-----------|-----------|-------------|--------------|
| 1     | 2  | 3    | 4    | 5         | 6         | 7           | 8            |
|       |  |      |      |           |           | -           | -            |
|       |  |      |      |           |           | -           | -            |
| 1.14  | Providing and fixing white vitreous china <b>battery based infrared sensor operated urinal</b> of approx. size 610 x 390 x 370 mm having pre & post flushing with water (250 ml & 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge ROCA model no. RS35945E000 or other equivalent model as per approved make.  | Each | 150  | 5,162.20  |           | 7,74,330.00 | -            |
|       |  |      |      |           |           | -           | -            |
| 1.15  | Providing and fixing <b>floor mounted</b> , white vitreous china single piece, double traps syphonic <b>water closet</b> of approved brand/ make, shape, size and pattern including integrated white vitreous china cistern of capacity 10 litres with dual flushing system, including all fittings and fixtures with seat cover, cistern fittings, nuts, bolts and gasket etc including making connection with the existing P/S trap, complete in all respect as per directions of Engineer-in-Charge.(ROCA model no. RS349467000 & RE80P467001 or other equivalent model as per approved make) | Each | 60   | 12,612.65 |           | 7,56,759.00 | -            |
|       |  |      |      |           |           | -           | -            |
| 1.16  | Extra for Providing and fixing <b>wall hung water closet</b> with seat cover of approved model and slim concealed flushing cistern of 9 litre capacity, body with floor mounted frame and installation kit with SS actuating panel with dual flush with fittings in place of pedestal type water closet 10 lits. & vitreous china cistern ,complete of <b>Roca make &amp; model RS 34630346S, RA80P396461 &amp; RA890031410</b> respectively or equivalent model of other approved make as approved by Engineer-in-charge.   | Each | 1080 |           | 8,566.17  | -           | 92,51,463.15 |
|       |  |      |      |           |           | -           | -            |
| 1.17  | Providing and fixing <b>health faucet</b> with pipe and hook complete ( Roca model no. RF9060A1 or other equivalent model as per approved make)  | Each | 1245 |           | 1,907.61  | -           | 23,74,972.16 |
|       |  |      |      |           |           | -           | -            |
| 1.18  | Extra for providing and fixing white vitreous china <b>oval shape wash basin</b> in place of normal wash basin of size 580x440   |      |      |           |           | -           | -            |
|       | <b>under Counter oval shape wash basin</b> size 600x390mm approx. (centre tap hole) along with , single 15 mm CP brass pressmatic type pillar tap.(Roca model no. RS327893000 and RT5A4277C00 or other equivalent model as per approved make)  | Each | 1440 |           | 4,562.42  | -           | 65,69,886.97 |
|       |  |      |      |           |           | -           | -            |
| 1.19  | Providing and fixing white <b>vitreous china urinal</b> of approx. size 797x 425 mm having top inlet urinal with <b>CP brass pressmatic urinal valve</b> auto closing system with built in control cock & wall flanged complete including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge.(roca model no. RS35945H000 & Jaquar model no.PRS-077 or other equivalent model as per approved make)   | Each | 150  |           | 11,706.80 | -           | 17,56,020.18 |
|       |  |      |      |           |           | -           | -            |

| S. No | Item Description  | Unit | Qty  | DSR Rate | NSR Rate  | DSR Amount | NSR Amount   |
|-------|---|------|------|----------|-----------|------------|--------------|
| 1     | 2   | 3    | 4    | 5        | 6         | 7          | 8            |
| 1.20  | Extra for providing and fixing Sentronic Concealed <b>Urinal Sensor</b> Powered by 220 volts-AC. Concealed box dimension: 110x110x92 mm Front plate dimension :120 x120 mm in place of pressmatic urinal valve. code RT5X9215E00 from roca or other equivalent make.  | Each | 150  |          | 9,754.85  | -          | 14,63,226.97 |
|       |   |      |      |          | -         | -          | -            |
| 1.21  | P&F wall <b>Soap Holder</b> with brackets' , complete fittings of roca or other equivalent approved make ( Jaquar or other equivalent model as per approved make)   | Each | 128  |          | 1,193.13  | -          | 1,52,721.28  |
|       |   |      |      |          | -         | -          | -            |
| 1.22  | Providing and fixing <b>Liquid Soap Dispenser</b> all complete (Roca model No. RA 816070105 or equivalent model approved make)  | Each | 1189 |          | 1,691.51  | -          | 20,11,201.14 |
|       |   |      |      |          | -         | -          | -            |
| 1.23  | Providing and fixing CP brass <b>towel rail</b> complete of approve quality and colour .(Jaquar or other equivalent make.)  |      |      |          | -         | -          | -            |
|       | 600 mm long towel rail  | Each | 1089 |          | 1,404.31  | -          | 15,29,292.86 |
|       |   |      |      |          | -         | -          | -            |
| 1.24  | providing and fixing CP Brass <b>bottle trap</b> for sink and urinal basin including CP waste fittings complete 40 mm dia complete in all respect of approved quality.  | Each | 1076 |          | 2,304.15  | -          | 24,79,261.78 |
|       |   |      |      |          | -         | -          | -            |
| 1.25  | providing & fixing <b>double robe hook</b> with all complete fittings(Jaquar or other equivalent model as per approved make)  | Each | 881  |          | 659.33    | -          | 5,80,872.55  |
|       |   |      |      |          | -         | -          | -            |
| 1.26  | Supply and Installation of Grab Bar S, type-304, 18-gauge (1 mm) stainless steel tubing with satin-finish. 1-1/2" (25.4mm) outside diameter.<br>Concealed Mounting Flanges — 18-8 S, type-304, stainless steel plate; end flanges with two holes for attachment to wall.<br>Snap Flange Covers — 18-8 S, type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. Each cover snaps over mounting flange to conceal mounting screws.<br>Make - Euronics or equivalent - 600mm (L)                             | Each | 109  |          | 1,755.68  | -          | 1,91,369.12  |
|       |   |      |      |          | -         | -          | -            |
| 1.27  | Supply and Installation of Swing Grab Bar 18-8 S, type-304, 18-gauge (1mm) stainless steel tubing with satin-finish. 1-1/4 (25mm) outside diameter. Ends are heliarc welded to flanges.<br>Backplate - 18-8 S, type-304, 3/16" (5mm) thick, satin-finish stainless steel with four screw holes for attachment to wall.<br>Make - Euronics - EGRS 02 or equivalent   | Each | 109  |          | 21,505.53 | -          | 23,44,102.23 |
|       |   |      |      |          | -         | -          | -            |
| 1.28  | Providing & fixing SS body solid state fully hygienic no touch <b>Hand Drier</b> of approved make rated for continuous repeat usage with solid state time delay LSF protection, with independent ambient light level & seasonal control temperatures including providing necessary C.I./M.S. brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, wiring cables from drier to plug, plug tops etc. complete including cutting and making good the walls wherever required. | Each | 90   |          | 21,826.63 | -          | 19,64,396.46 |
|       |   |      |      |          | -         | -          | -            |

| S. No       | Item Description  | Unit  | Qty   | DSR Rate | NSR Rate | DSR Amount            | NSR Amount |                       |
|-------------|---|-------|-------|----------|----------|-----------------------|------------|-----------------------|
| 1           | 2   | 3     | 4     | 5        | 6        | 7                     | 8          |                       |
| 1.29        | Providing and fixing Hospital S S 304 -18 SWG(thickness 2.0 mm) <b>bed pan sink</b> with P trap, size 850W x 600Dx300Hmm + SPL with 10 litres PVC. flushing cistern , 32 mm dia flush pipe cpvc , C.I./M.S. bracket with painting with 3 coats of white paint complete with accessories, C.P. brass long body bib cock and health fucet fittings (CMP.METAL,VIJAYA, MPS ) or equivalent approved make as approved by Engineer in-charge.  | Each  | 35    |          |          | 36,580.09             | -          | 12,80,303.07          |
|             |   |       |       |          |          | -                     | -          | -                     |
| 1.30        | Supply , installation, testing and commissioning of compact floor mounted pedestal base <b>surgical scrub sink</b> tailor made to suit the site available compatiabile with all the regular and standard plumbing system, with inbuilt geyser designed for use in operation theatre fabricated from thickness 1.6 mm 304 type stainless steel seamless 304 welded,polished to satain finish including connecting to drainage and water points and making good cutting of walls and floor surface all complete and as directed (CMP.METAL ,VIJAYA, MPS) or equivalent approved make as approved by Engineer-in-charge. |       |       |          |          | -                     | -          | -                     |
|             | Tailor made surgical scrub sink (2 bay) Approximate size 1.4 mX0.54mX0.84m with 1 user elbow operated mixture tap, soap dispensers, drain outlet ,thermostatic control of water temperature   | Each  | 20    |          |          | 2,20,325.22           | -          | 44,06,504.46          |
|             |   |       |       |          |          | -                     | -          | -                     |
| 1.31        | Providing and fixing <b>stone slab with table</b> rubbed, edges rounded and polished, of size 75x50 cm deep and 1.8 cm thick, fixed in <b>urinal partitions</b> by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement<br>concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth.  |       |       |          |          |                       | -          | -                     |
|             | Granite stone of approved shade   | Each  | 300   | 2,831.95 |          | 8,49,585.00           | -          | -                     |
|             | <b>SUB TOTAL( SANITARY FIXTURES)</b>  |       |       |          |          | <b>1,65,73,840.25</b> |            | <b>3,83,55,594.35</b> |
| <b>2.00</b> | <b>SOIL, WASTE AND VENT PIPES</b>   |       |       |          |          |                       |            | -                     |
| 2.01        | Providing and fixing soil, waste and vent pipes- <b>Hubless centrifugally cast (spun) iron pipes epoxy coated inside &amp; outside IS:15905 (make: NECO, HEPCO &amp; SKF)</b>   |       |       |          |          |                       | -          | -                     |
| a)          | 50mm dia  | Metre | 1000  |          |          | 684.00                | -          | 6,84,000.00           |
|             | Hubless Centrifugaly cast (spun) iron pipes epoxy coated inside and outside IS:15905  |       |       |          |          |                       | -          | -                     |
| b)          | 75mm dia  | Metre | 2210  | 759.80   |          | 16,79,158.00          | -          | -                     |
| b.i)        | Hubless Centrifugaly cast (spun) iron pipes epoxy coated inside and outside IS:15905  |       |       |          |          |                       | -          | -                     |
| c)          | 100 mm dia-Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905  | Metre | 13500 | 925.55   |          | 1,24,94,925.00        | -          | -                     |
| d)          | 150 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905   | Metre | 2200  |          |          | 2,024.00              | -          | 44,52,800.00          |
| e)          | 200 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905   | Metre | 500   |          |          | 3,329.00              | -          | 16,64,500.00          |
|             |   |       |       |          |          | -                     | -          | -                     |
| 2.02        | Providing and fixing <b>bend of required degree</b> with <b>access door</b> , insertion rubber washer 3 mm thick, bolts and nuts complete.  |       |       |          |          |                       | -          | -                     |

| S. No | Item Description   | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount   |
|-------|--|-------|------|----------|----------|--------------|--------------|
| 1     | 2  | 3     | 4    | 5        | 6        | 7            | 8            |
| a)    | 100 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905  | Each  | 1495 | 489.45   |          | 7,31,727.75  | -            |
| b)    | 150 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905  | Each  | 195  |          | 701.00   | -            | 1,36,695.00  |
| c)    | 200 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905  | Metre | 20   |          | 1,052.00 | -            | 21,040.00    |
|       |  |       |      |          |          | -            | -            |
| 2.03  | Providing and fixing <b>plain bend</b> of required degree.   |       |      |          |          | -            | -            |
| a)    | 50 mm dia  | Each  | 400  |          | 101.00   | -            | 40,400.00    |
| a.i)  | Hubless Centrifugally cast (spun) iron pipes epoxy coated inside and outside IS:15905  |       |      |          |          | -            | -            |
| b)    | 75 mm dia  | Each  | 108  | 212.20   |          | 22,917.60    | -            |
| b.i)  | Hubless Centrifugally cast (spun) iron pipes epoxy coated inside and outside IS:15905  |       |      |          |          | -            | -            |
| c)    | 100 mm -Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905  | Each  | 1760 | 307.10   |          | 5,40,496.00  | -            |
| d)    | 150 mm dia-Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside  | Each  | 200  |          | 675.00   | -            | 1,35,000.00  |
| e)    | 200 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905  | Each  | 20   |          | 1,333.00 | -            | 26,660.00    |
|       |  |       |      |          |          | -            | -            |
| 2.04  | Providing and fixing <b>double equal plain junction</b> of required degree.  |       |      |          |          | -            | -            |
| a)    | 75x75x75   | Each  | 230  | 283.05   |          | 65,101.50    | -            |
| a.i)  | Hubless Centrifugally cast (spun) iron pipes epoxy coated inside and outside IS:15905  |       |      |          |          | -            | -            |
| b)    | 100x100x100x100 mm Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside  | Each  | 305  | 645.10   |          | 1,96,755.50  | -            |
| c)    | 150x150x150x150 mm Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside  | Each  | 35   |          | 1,822.00 | -            | 63,770.00    |
| d)    | 200 X200X200 X200mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside   | Each  | 15   |          | 2,368.00 | -            | 35,520.00    |
|       |  |       |      |          |          | -            | -            |
| 2.05  | Providing and fixing <b>single equal plain junction</b> of required degree with access <b>door</b> , insertion rubber washer 3mm thick, bolts and nuts complete. |       |      |          |          | -            | -            |
| a)    | 100x100x100mm - S & S/H.L.C.C.I  | Each  | 490  | 623.00   |          | 3,05,270.00  | -            |
| b)    | 150x 150x 150 mm-H.L.C.C.I   | Each  | 300  |          | 1,665.00 | -            | 4,99,500.00  |
| c)    | 200x200x200 mm-H.L.C.C.I   | Each  | 20   |          | 3,266.00 | -            | 65,320.00    |
|       |  |       |      |          |          | -            | -            |
| 2.06  | Providing and fixing <b>single equal plain junction</b> of required degree   |       |      |          |          | -            | -            |
| a)    | 100x100x100mm -Hubless centrifugally cast (spun) iron epoxy coated inside & outside  | Each  | 2055 | 503.40   |          | 10,34,487.00 | -            |
| b)    | 150x150x150-Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside   | Each  | 295  |          | 1,514.00 | -            | 4,46,630.00  |
| c)    | 200 X200X200 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside   | Each  | 25   |          | 2,969.00 | -            | 74,225.00    |
|       |  |       |      |          |          | -            | -            |
| 2.07  | Providing and fixing <b>single unequal plain junction</b> of required degree   |       |      |          |          | -            | -            |
| a)    | 150x150x100 mm-H.L.C.C.I   | Each  | 1145 |          | 1,179.00 | -            | 13,49,955.00 |

| S. No | Item Description  | Unit  | Qty   | DSR Rate | NSR Rate | DSR Amount   | NSR Amount   |
|-------|---|-------|-------|----------|----------|--------------|--------------|
| 1     | 2   | 3     | 4     | 5        | 6        | 7            | 8            |
| b)    | 200x200x150 mm-H.L.C.C.I  | Each  | 100   |          | 1,928.00 | -            | 1,92,800.00  |
| c)    | 200x200x100 mm-H.L.C.C.I  | Each  | 20    |          | 1,503.00 | -            | 30,060.00    |
|       |   |       |       |          |          | -            | -            |
| 2.08  | Providing and fixing <b>door piece</b> , insertion rubber washer 3mm thick, bolts and nuts complete   |       |       |          |          | -            | -            |
| a)    | 100 mm CI   | Each  | 1190  | 512.65   |          | 6,10,053.50  | -            |
|       |   |       |       |          |          | -            | -            |
| 2.09  | Providing and fixing <b>terminal guard</b> .  |       |       |          |          | -            | -            |
| a)    | 100 mm-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905   | Each  | 395   | 355.85   |          | 1,40,560.75  | -            |
| b)    | 150 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905   | Each  | 35    |          | 786.00   | -            | 27,510.00    |
| c)    | 200 mm dia-Hubless centrifugally cast (spun) iron epoxy coated inside & outside as per IS:15905   | Each  | 10    |          | 865.00   | -            | 8,650.00     |
|       |   |       |       |          |          | -            | -            |
| 2.10  | Providing and fixing <b>shielded coupling for Hubless centrifugally cast iron pipe of same manufactureing</b> .   |       |       |          |          | -            | -            |
| a)    | 100 mm dia-SS 304 grade coupling with EPDM rubber gasket  | Each  | 13500 | 360.50   |          | 48,66,750.00 | -            |
| b)    | 150 mm dia  | Each  | 2200  |          | 584.00   | -            | 12,84,800.00 |
| c)    | 200 mm dia  | Each  | 500   |          | 871.00   | -            | 4,35,500.00  |
|       |   |       |       |          |          | -            | -            |
| 2.11  | Providing and fixing <b>M.S. stays and clamps</b> for sand cast iron / centrifugally cast (spun) iron pipes of diameter :   |       |       |          |          | -            | -            |
| a)    | 100 mm  | Each  | 385   | 62.00    |          | 23,870.00    | -            |
| b)    | 150 mm dia  | Each  | 35    |          | 80.00    | -            | 2,800.00     |
| c)    | 200 mm dia  | Each  | 10    |          | 143.00   | -            | 1,430.00     |
|       |   |       |       |          |          | -            | -            |
| 2.12  | Providing and fixing <b>Trap</b> of self cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors:  |       |       |          |          | -            | -            |
| a)    | 100 mm inlet and 100 mm outlet-Hubless centrifugally cast (spun) iron epoxy coated inside & outside   | Each  | 2047  | 677.60   |          | 13,87,047.20 | -            |
|       |   |       |       |          |          | -            | -            |
| 2.13  | <b>Cutting chases</b> in brick masonry walls for following diameter sand cast iron/centrifugally cast (spun) iron pipes and making good the same with cement concrete 1:3:6 (1 cement:3 coarse sand:6 graded stone aggregate 12.5 mm nominal size) including necessary plaster and pointing in cement mortar 1:4 (1 cement: 4 coarse sand): |       |       |          |          | -            | -            |
| a)    | 100 mm diameter pipe  | Metre | 790   | 355.70   |          | 2,81,003.00  | -            |
|       |   |       |       |          |          | -            | -            |
| 2.14  | <b>Painting</b> sand cast iron / centrifugally cast (spun) iron soil, waste vent pipes and fittings with paint of any colour such as chocolate, grey, or buff etc. over a coat of primer (of approved quality) for new work:  |       |       |          |          | -            | -            |
| a)    | 50 mm   | Metre | 1000  |          | 23.00    | -            | 23,000.00    |
| b)    | 75 mm   | Metre | 2210  | 31.00    |          | 68,510.00    | -            |
| c)    | 100 mm diameter pipe  | Metre | 18995 | 40.65    |          | 7,72,146.75  | -            |
| d)    | 150 mm diameter pipe  | Metre | 2200  |          | 88.00    | -            | 1,93,600.00  |
| e)    | 200 mm diameter pipe  | Metre | 300   |          | 117.00   | -            | 35,100.00    |



| S. No | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount  | NSR Amount   |
|-------|---|-------|------|----------|----------|-------------|--------------|
| 1     | 2   | 3     | 4    | 5        | 6        | 7           | 8            |
|       |   |       |      |          |          | -           | -            |
| 2.15  | Providing and fixing <b>M.S. holder bat clamp</b> of approved design to sand cast iron/ cast iron (spun) pipes comprising of M.S. flat brackets made of 50x5 mm flat of specified shape, projecting 75 mm outside the wall surface and fixed on wall with 4nos, 6mm dia expansion hold fasteners, including drilling necessary holes in brick wall/ CC/ RCC surface and the cost of bolts etc. The pipes shall be fixed to the already fixed brackets with the help of 30 mm x1.6 mm galvanised M.S. flats of specified shape and of total length 420 mm and shall be fixed with M.S. nuts, bolts, & washers of size 25x6 mm, one bolts on each side of the pipe. |       |      |          |          | -           | -            |
| a)    | Total bracket length 580 mm of approved shape and design (for single 100/150 mm dia pipe)   | Each  | 3713 | 179.40   |          | 6,66,112.20 | -            |
| b)    | Total bracket length 810 mm of approved shape and design (for two 100/150 mm dia pipes or 150mm)  | Each  | 2934 | 216.30   |          | 6,34,624.20 | -            |
| c)    | Total bracket length 1040 mm of approved shape and design (for three 100/150 mm dia pipes)  | Each  | 450  | 253.15   |          | 1,13,917.50 | -            |
| d)    | Total bracket length 1540 mm of approved shape and design (for three 200/150 mm dia pipes)  | Each  | 80   |          | 419.00   | -           | 33,520.00    |
|       |   |       |      |          |          | -           | -            |
| 2.16  | Providing and fixing <b>GI pipes</b> complete with GI fittings and clamps, i/c cutting and making good the walls etc and making good the same for waste water disposal complete as per direction of engineer incharge.  |       |      |          |          | -           | -            |
| a)    | 32 mm dia nominal bore (Wash basin to floor trap/floor drain)   | Metre | 2150 | 308.35   |          | 6,62,952.50 | -            |
| b)    | 40 mm dia nominal bore (Sink,Urinal to floor trap)  | Metre | 1270 | 394.15   |          | 5,00,570.50 | -            |
| c)    | 50 mm dia nominal bore (Floor Drain to Floor Trap and Hor. Vent)  | Metre | 650  | 472.40   |          | 3,07,060.00 | -            |
|       |   |       |      |          |          | -           | -            |
|       |   |       |      |          |          | -           | -            |
| 2.17  | Providing and fixing <b>floor drain &amp; balcony drain</b> made of 100 x 50 mm dia elbow / tee as applicable connected with 50 mm dia GI pipe painted with primer, two coats of black bituminastic paint,wrapping 1 mm thick PVC tape and final coat of black bituminastic paint B109 complete in all complete including cutting and making good the walls and floor wherever required   | Each  | 750  |          | 518.00   | -           | 3,88,500.00  |
|       |   |       |      |          |          | -           | -            |
| 2.18  | Providing and laying <b>cement concrete</b> 1:2:4 (1 cement:2 coarse sand:4 graded stone aggregate 20 mm nominal size) 80 mm thick all-round the SCI/centrifugally S&S pipe diameter.   |       |      |          |          | -           | -            |
|       | 100/150 mm dia  | Metre | 3885 |          | 534.00   | -           | 20,74,590.00 |
|       |   |       |      |          |          | -           | -            |
| 2.19  | Providing and fixing <b>dash fastner</b> made of rust proof plated steel for holding the soil/waste supply pipes complete in all respect  |       |      |          |          | -           | -            |
|       | Dash fastner for pipe more than 25 mm dia to 150 mm dia pipe of size 25 mm dia and 75 mm long minimum & shall be capable of taking 6 tonnes load and also include the supporting angles 35x35x5 mm/ of required size or MS bars steel structures as per drawing.  | Each  | 4745 |          | 486.00   | -           | 23,06,070.00 |
|       |   |       |      |          |          | -           | -            |

| S. No | Item Description  | Unit | Qty  | DSR Rate | NSR Rate  | DSR Amount | NSR Amount   |
|-------|---|------|------|----------|-----------|------------|--------------|
| 1     | 2   | 3    | 4    | 5        | 6         | 7          | 8            |
| 2.20  | Providing and fixing <b>SS Grating (FD+FT)</b> grating 143x143x5 mm thick screwable with SS fixed framed of 150x150 mm size as per approved make and model  | Each | 2448 |          | 445.00    | -          | 10,89,360.00 |
|       |   |      |      |          |           | -          | -            |
| 2.21  | Providing and fixing floor <b>clean out plug</b> consist of CI bend & GI socket heavy class with Brass cap & key for opening male threaded cap etc. including lead caulked to CI pipescomplete in all respects as per drawing/ sample approved by Engineer -in - ChargeFCO (floor clean out plug shall be flushed with floor finish   |      |      |          |           | -          | -            |
|       | 100 mm dia/150/200 mm dia   | Each | 2797 |          | 2,128.00  | -          | 59,52,016.00 |
|       |   |      |      |          |           | -          | -            |
| 2.22  | Providing and fixing <b>G.I EXTENSION PIECE</b> for 100 mm dia floor trap formed out of main pipe( Type A) with multiple side inlets, suitable for various dia pipes, side connections, including all fixtures and fittings as per site conditions and as per standard details and water tight sealing of joints and area surrounding the grating and as directed.  | Each | 1960 |          | 1,137.00  | -          | 22,28,520.00 |
|       |   |      |      |          |           | -          | -            |
| 2.23  | Supply, installing, testing and commissioning vertical fully floodable type submersible sewage pump of non-corrosive material with shredder/cutter in close coupled design single stage, suitable for handling minimum 10 mm dia solids for transferring raw sewer from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump,start and stop push button contactor with required overload production and single phase preventor.Electicl panal complet as per instruction of the Engineer in charge. <b>(For Basement Toilet)</b> |      |      |          |           |            | -            |
|       | Material of Construction (M.O.C):<br>Corrosion Resistant in general   |      |      |          |           |            | -            |
|       | : Casing — Cast Iron  |      |      |          |           |            | -            |
|       | : Impeller — Ductile cast iron/SS   |      |      |          |           |            | -            |
|       | : Bearings — Anti friction,<br>prelubricated ball bearings,<br>packed with grease for life.   |      |      |          |           |            | -            |
|       | Motor: — Dry Motor with built in over<br>load protection  |      |      |          |           |            | -            |
|       | Protection - IP68.  |      |      |          |           |            | -            |
|       | Insulation Class - F  |      |      |          |           |            | -            |
|       | RAW SEWAGE PUMP   |      |      |          |           |            | -            |
|       | Capacity -250 LPM (min.) - 2 Nos  |      |      |          |           |            | -            |
|       | Head - 10 m   |      |      |          |           |            | -            |
|       | RAW SEWAGE PUMP Electrical & mechanical Works , excluding civil works   | Each | 2    |          | 98,500.00 |            | 1,97,000.00  |
|       |   |      |      |          |           | -          | -            |

| S. No       | Item Description  | Unit  | Qty   | DSR Rate | NSR Rate | DSR Amount            | NSR Amount            |
|-------------|---|-------|-------|----------|----------|-----------------------|-----------------------|
| 1           | 2   | 3     | 4     | 5        | 6        | 7                     | 8                     |
| 2.24        | Providing and fixing <b>WC connector socket(for vitreous china &amp; CI pipe)</b> of EDPM good quality with polypropylene body 100x150/100x250 of approved quality and make complete in all respect.  | Each  | 915   |          | 419.20   | -                     | 3,83,568.00           |
|             |   |       |       |          |          | -                     | -                     |
|             | <b>SUB TOTAL(SOIL, WASTE AND VENT PIPES)</b>  |       |       |          |          | <b>2,81,06,016.45</b> | <b>2,65,84,409.00</b> |
|             |   |       |       |          |          | -                     | -                     |
| <b>3.00</b> | <b>WATER SUPPLY</b>   |       |       |          |          |                       | -                     |
|             |   |       |       |          |          | -                     | -                     |
| 3.01        | Providing and fixing <b>Chlorinated Polyvinyl Chloride (CPVC) pipes</b> , having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. <b>INTERNAL WORK - EXPOSED ON WALL</b> |       |       |          |          | -                     | -                     |
|             | <b>Internal work – Exposed on wall for Domestic- other than flushing</b>  |       |       |          |          | -                     | -                     |
| a)          | 15 mm nominal outer dia Pipes(SDR-11)   | Metre | 325.5 | 142.95   |          | 46,530.23             | -                     |
| b)          | 20 mm nominal outer dia Pipes(SDR-11)   | Metre | 507.5 | 179.95   |          | 91,324.63             | -                     |
| c)          | 25 mm nominal outer dia Pipes(SDR-11)   | Metre | 1407  | 216.20   |          | 3,04,193.40           | -                     |
| d)          | 32 mm nominal outer dia Pipes(SDR-11)   | Metre | 1673  | 289.05   |          | 4,83,580.65           | -                     |
| e)          | 40 mm nominal outer dia Pipes(SDR-11)   | Metre | 2639  | 385.50   |          | 10,17,334.50          | -                     |
| f)          | 50 mm nominal outer dia Pipes(SDR-11)   | Metre | 2450  | 548.55   |          | 13,43,947.50          | -                     |
| g)          | 62.5 mm nominal inner dia Pipes(SCH-80)   | Metre | 1810  |          | 1,345.00 | -                     | 24,34,450.00          |
| h)          | 75 mm nominal inner dia Pipes(SCH-80)   | Metre | 1245  |          | 1,982.00 | -                     | 24,67,590.00          |
| i)          | 100 mm nominal inner dia Pipes(SCH-80)  | Metre | 850   |          | 2,940.00 | -                     | 24,99,000.00          |
| j)          | 150 mm nominal inner dia Pipes(SCH-80)  | Metre | 810   |          | 6,837.00 | -                     | 55,37,970.00          |
|             |   |       |       |          |          | -                     | -                     |
| 3.01a       | Providing and fixing 3 layer PP-R (poly propylene Random Copolymer) pipes, U V Stabilizer & anti-microbial fusion welding, having thermal stability for hot & cold water supply, including all PP-R plain & brass threaded polypropylene random fittings including trenching, refilling & testing of joints complete as per direction of engineer in charge.  |       |       |          |          | -                     | -                     |
|             | <b>Internal work – Exposed on wall For Flushing line</b>  |       |       |          |          | -                     | -                     |
| a)          | 15 mm nominal outer dia Pipes(SDR-11)   | Metre | 139.5 |          | 63.00    | -                     | 8,788.50              |
| b)          | 20 mm nominal outer dia Pipes(SDR-11)   | Metre | 217.5 |          | 69.00    | -                     | 15,007.50             |
| c)          | 25 mm nominal outer dia Pipes(SDR-11)   | Metre | 603   |          | 82.00    | -                     | 49,446.00             |
| d)          | 32 mm nominal outer dia Pipes(SDR-11)   | Metre | 717   |          | 124.00   | -                     | 88,908.00             |
| e)          | 40 mm nominal outer dia Pipes(SDR-11)   | Metre | 1131  |          | 185.00   | -                     | 2,09,235.00           |
| f)          | 50 mm nominal outer dia Pipes(SDR-11)   | Metre | 1050  |          | 278.00   | -                     | 2,91,900.00           |

| S. No | Item Description   | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount  |
|-------|--|-------|------|----------|----------|--------------|-------------|
| 1     | 2  | 3     | 4    | 5        | 6        | 7            | 8           |
| 3.02  | Providing and fixing <b>Chlorinated Polyvenyl Chloride(CPVC)pipes</b> having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings i/c fixing the pipe with clamps at 1.0 m spacing.This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in charge.       |       |      |          |          | -            | -           |
|       |  |       |      |          |          | -            | -           |
|       | <b>Concealed work including cutting chases and making good the walls etc.-For doestic-Other than flushing</b>  |       |      |          |          | -            | -           |
| a)    | 15 mm nominal outer dia pipes (SDR-11)   | Metre | 1050 | 246.20   |          | 2,58,510.00  | -           |
| b)    | 20 mm nominal outer dia pipes (SDR-11)   | Metre | 8400 | 284.85   |          | 23,92,740.00 | -           |
| c)    | 25 mm nominal outer dia pipes (SDR-11)   | Metre | 3150 | 333.60   |          | 10,50,840.00 | -           |
| d)    | 32 mm nominal outer dia pipes (SDR-11)   | Metre | 1750 | 412.90   |          | 7,22,575.00  | -           |
| e)    | 40mm nominal outer dia pipes (SDR-11)  | Metre | 315  |          | 357.00   | -            | 1,12,455.00 |
|       |  |       |      |          |          | -            | -           |
| 3.02a | Providing and fixing 3 layer PP-R (poly propelyene Random Copolymer) pipes, U V Stabilizer & anti-microbial fusion welding, having thermal stability for hot & cold water supply, including all PP-R plain & brass threaded polypropelyne random fittings & testing of joints complete as per direction of engineer in charge.   |       |      |          |          | -            | -           |
|       | <b>Concealed work including cutting chases and making good the walls etc.For flushing line</b>   |       |      |          |          | -            | -           |
| a)    | 15 mm nominal outer dia pipes (SDR-11)   | Metre | 450  |          | 66.00    | -            | 29,700.00   |
| b)    | 20 mm nominal outer dia pipes (SDR-11)   | Metre | 3600 |          | 73.00    | -            | 2,62,800.00 |
| c)    | 25 mm nominal outer dia pipes (SDR-11)   | Metre | 1350 |          | 87.00    | -            | 1,17,450.00 |
| d)    | 32 mm nominal outer dia pipes (SDR-11)   | Metre | 750  |          | 132.00   | -            | 99,000.00   |
| e)    | 40mm nominal outer dia pipes (SDR-11)  | Metre | 135  |          | 197.00   | -            | 26,595.00   |
|       |  |       |      |          |          |              |             |
| 3.03  | Providing and fixing <b>Chlorinated Polyvinyl Chloride (CPVC) pipes</b> , having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. |       |      |          |          | -            | -           |
|       | <b>External Work</b>   |       |      |          |          | -            | -           |
| a)    | 32 mm nominal outer dia pipes (SDR-11)   | Metre | 100  | 250.55   |          | 25,055.00    | -           |
| b)    | 40 mm nominal outer dia pipes (SDR-11)   | Metre | 100  | 321.15   |          | 32,115.00    | -           |
| c)    | 50 mm nominal outer dia Pipes (SDR-11)   | Metre | 375  | 484.25   |          | 1,81,593.75  | -           |
| d)    | 62.5 mm nominal inner dia Pipes (SCH-80)   | Metre | 450  | 1,081.75 |          | 4,86,787.50  | -           |
| e)    | 75 mm nominal inner dia Pipes (SCH-80)   | Metre | 450  | 1,201.05 |          | 5,40,472.50  | -           |
| f)    | 100 mm nominal inner dia Pipes (SCH-80)  | Metre | 100  | 1,618.10 |          | 1,61,810.00  | -           |
| g)    | 150 mm nominal inner dia Pipes (SCH-80)  | Metre | 100  | 2,408.75 |          | 2,40,875.00  | -           |
|       |  |       |      |          |          | -            | -           |
| 3.04  | Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc.   |       |      |          |          | -            | -           |
| a)    | 40 mm dia nominal bore   | Metre | 50   | 301.05   |          | 15,052.50    | -           |
| b)    | 50 mm dia nominal bore   | Metre | 50   | 342.70   |          | 17,135.00    | -           |

| S. No | Item Description  | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount  | NSR Amount  |
|-------|---|-------|-----|----------|----------|-------------|-------------|
| 1     | 2   | 3     | 4   | 5        | 6        | 7           | 8           |
| c)    | 65 mm dia nominal bore  | Metre | 50  | 451.00   |          | 22,550.00   | -           |
| d)    | 80 mm dia nominal bore  | Metre | 50  | 576.30   |          | 28,815.00   | -           |
|       |   |       |     |          |          | -           | -           |
| 3.05  | Painting G.I. pipes and fittings with two coats of anti-corrosive bitumastic paint of approved quality :  |       |     |          |          | -           | -           |
| a)    | 40 mm dia nominal bore  | Metre | 50  | 12.35    |          | 617.50      | -           |
| b)    | 50 mm dia nominal bore  | Metre | 50  | 14.80    |          | 740.00      | -           |
| c)    | 65 mm dia nominal bore  | Metre | 50  | 18.25    |          | 912.50      | -           |
| d)    | 80 mm dia nominal bore  | Metre | 50  | 21.20    |          | 1,060.00    | -           |
|       |   |       |     |          |          | -           | -           |
| 3.06  | Providing and filling sand of grading zone V or coarser grade, allround the G.I. pipes in external work :   |       |     |          |          | -           | -           |
| a)    | 40 mm diameter pipe   | Metre | 50  | 72.25    |          | 3,612.50    | -           |
| b)    | 40 mm diameter pipe   | Metre | 50  | 74.95    |          | 3,747.50    | -           |
| c)    | 65 mm diameter pipe   | Metre | 50  | 118.30   |          | 5,915.00    | -           |
| d)    | 80 mm dia nominal bore  | Metre | 50  | 121.90   |          | 6,095.00    | -           |
|       |   |       |     |          |          | -           | -           |
| 3.07  | <b>Making connection of G.I./CPVC distribution branch</b> with G.I./D.I main of following sizes by providing and fixing tee, including, cutting and threading the pipe etc. complete including obtaining approval for connection from Municipal corporation , if required |       |     |          |          | -           | -           |
| a)    | 25 to 150 mm nominal bore   | Each  | 18  | 771.20   |          | 13,881.60   | -           |
|       |   |       |     |          |          | -           | -           |
| 3.08  | providing and fixing <b>Gun metal gate valve</b> with C.I. wheel of approved quality (screwed end)  |       |     |          |          | -           | -           |
| a)    | 25 mm nominal bore  | Each  | 90  | 428.20   |          | 38,538.00   | -           |
| b)    | 20 mm nominal bore  | Each  | 183 | 396.55   |          | 72,568.65   | -           |
| c)    | 32 mm nominal bore  | Each  | 240 | 500.75   |          | 1,20,180.00 | -           |
| d)    | 40 mm nominal bore  | Each  | 462 | 584.70   |          | 2,70,131.40 | -           |
| e)    | 50 mm nominal bore  | Each  | 333 | 749.90   |          | 2,49,716.70 | -           |
|       |   |       |     |          |          | -           | -           |
| 3.09  | providing and fixing <b>CI Butterfly valve</b> with C.I. wheel of approved quality (screwed end)  |       |     |          |          |             |             |
| a)    | 65 mm nominal bore  | Each  | 90  |          | 2,740.00 | -           | 2,46,600.00 |
| b)    | 80 mm nominal bore  | Each  | 50  |          | 3,245.00 | -           | 1,62,250.00 |
| c)    | 100 mm nominal bore   | Each  | 8   |          | 3,747.00 | -           | 29,976.00   |
| d)    | 150 mm nominal bore   | Each  | 4   |          | 5,614.00 | -           | 22,456.00   |
|       |   |       |     |          |          | -           | -           |
| 3.10  | Providing and fixing <b>Ball valve</b> (brass) of approved quality, High or low pressure with plastic floats complete   |       |     |          |          | -           | -           |
| a)    | 15 mm   | Each  | 80  | 287.25   |          | 22,980.00   | -           |
| b)    | 20mm.   | Each  | 149 | 327.05   |          | 48,730.45   | -           |
|       |   |       |     |          |          | -           | -           |
| 3.11  | Providing and fixing <b>Gun metal non-return valve</b> of approved quality (screwed end)  |       |     |          |          | -           | -           |
| a)    | 25 mm nominal bore  |       |     |          |          | -           | -           |
| a.i)  | Horizontal  | Each  | 10  | 410.45   |          | 4,104.50    | -           |
| b)    | 40 mm nominal bore  |       |     |          |          | -           | -           |
| b.i)  | Horizontal  | Each  | 20  | 682.85   |          | 13,657.00   | -           |

| S. No | Item Description   | Unit      | Qty    | DSR Rate | NSR Rate | DSR Amount   | NSR Amount |
|-------|--|-----------|--------|----------|----------|--------------|------------|
| 1     | 2  | 3         | 4      | 5        | 6        | 7            | 8          |
| c)    | 50 mm nominal bore   |           |        |          |          | -            | -          |
| c.i)  | Horizontal   | Each      | 20     | 987.70   |          | 19,754.00    | -          |
| d)    | Horizontal-80mm  | Each      | 2      | 2,503.10 |          | 5,006.20     | -          |
|       |  |           |        |          |          | -            | -          |
| 3.12  | Providing and fixing brass <b>Ferrule</b> with C.I. mouth cover including boring and tapping the main  |           |        |          |          | -            | -          |
| a)    | 25 mm nominal bore or as per required size   | Each      | 22     | 363.70   |          | 8,001.40     | -          |
| b)    | 40mm to 65 mm dia bore   | Each      | 22     |          | 951.00   | -            | 20,922.00  |
|       |  |           |        |          |          | -            | -          |
| 3.13  | Providing and fixing <b>unplasticised PVC connection</b> pipe with brass unions:   |           |        |          |          | -            | -          |
| a)    | 45 cm length   |           |        |          |          | -            | -          |
| a.i)  | 15 mm nominal bore   | Each      | 5884   | 67.80    |          | 3,98,935.20  | -          |
|       |  |           |        |          |          | -            | -          |
| 3.14  | <b>Constructing masonry chamber</b> 30x30x50 cm, inside with 75 class designation brick work in cement mortar 1:4 (1 cement: 4 coarse sand) for stop cock, with C.I. surface box 100x100x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement: 2 coarse sand:4 graded stone aggregate 20 mm nominal size) necessary excavation foundation concrete 1:5:10 (1 cement:5 fine sand: 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement :3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design |           |        |          |          | -            | -          |
| a)    | With F.P.s bricks  | Each      | 18     | 1,195.32 |          | 21,515.76    | -          |
|       |  |           |        |          |          | -            | -          |
| 3.15  | Providing and placing on <b>terrace</b> (at all floor levels) polyethylene <b>water storage tank</b> ISI:12701 marked with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank   |           |        |          |          | -            | -          |
| a)    | Treated water Tank and Untreated water tank  | per litre | 400000 | 7.25     |          | 29,00,000.00 | -          |
|       |  |           |        |          |          | -            | -          |
| 3.16  | Providing and fixing C.P brass <b>Bib Cock</b> of approved quality.(Jaquar or other equivalent model as per approved make)   |           |        |          |          | -            | -          |
| a)    | 15 mm nominal bore   | Each      | 800    | 371.70   |          | 2,97,360.00  | -          |
|       |  |           |        |          |          | -            | -          |
| 3.17  | Providing and fixing C.P. brass <b>long body bib cock</b> of approved quality conforming to IS standards and weighing not less than 690 gms. Code FLR-CHR-5021N From Jaquar or other equivalent make.  |           |        |          |          | -            | -          |
| a)    | 15 mm nominal bore   | Each      | 275    | 492.55   |          | 1,35,451.25  | -          |
|       |  |           |        |          |          | -            | -          |
| 3.18  | Providing and fixing C.P. brass <b>Angle Valve</b> for basin mixer and geyser/cisterns points of approved quality conforming to IS:8931.(jaquar or other equivalent model as per approved make)  |           |        |          |          | -            | -          |
| a)    | 15 mm nominal bore   | Each      | 6204   | 475.70   |          | 29,51,242.80 | -          |
|       |  |           |        |          |          | -            | -          |

| S. No | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount  | NSR Amount |
|-------|---|-------|------|----------|----------|-------------|------------|
| 1     | 2   | 3     | 4    | 5        | 6        | 7           | 8          |
| 3.19  | Providing and fixing C.P. Brass <b>extension nipple</b> (size 15mmx50mm) of approved make and quality as per direction of Engineer-in-charge.(jaquar or other equivalent model as per approved make)  | Each  | 6204 | 58.10    |          | 3,60,452.40 | -          |
|       |   |       |      |          |          | -           | -          |
| 3.20  | Providing and fixing <b>C.I. double acting air valve</b> of approved quality with bolts, nuts, rubber insertions etc. complete (The tail pieces, tapers etc. if required will be paid separately):  |       |      |          |          | -           | -          |
| a)    | 50 mm dia   | Each  | 40   | 4,662.45 |          | 1,86,498.00 | -          |
| b)    | 80 mm dia   | Each  | 30   | 5,649.75 |          | 1,69,492.50 | -          |
|       |   |       |      |          |          | -           | -          |
| 3.21  | Providing and fixing enclosed type <b>water meter</b> ( bulk type) conforming to IS : 2373 and tested by muncipal board complete with bolts,nuts rubber, insersions etc. ( the tail plases if required will be paid seperatly )   |       |      |          |          | -           | -          |
| a)    | 80 mm dia nominal bore (25 to 80 mm)  | Each  | 36   | 3,104.90 |          | 1,11,776.40 | -          |
|       |   |       |      |          |          | -           | -          |
| 3.22  | Providing and fixing PTMT <b>ball cock</b> of approved quality, colour and make complete with Epoxy coated aluminium rod with L.P./H.P.H.D. plastic ball.   |       |      |          |          | -           | -          |
| a)    | 40 mm nominal bore, 206 mm long weighin not less than 690 gms   | Each  | 20   | 646.70   |          | 12,934.00   | -          |
| b)    | 50 mm nominal bore, 242 mm long weighin not less than 1240 gms  | Each  | 20   | 1,125.25 |          | 22,505.00   | -          |
|       |   |       |      |          |          | -           | -          |
| 3.23  | <b>Cutting holes</b> upto 30x30 cm in walls including making good the same  |       |      |          |          | -           | -          |
| a)    | with F.P.S bricks   | Each  | 1900 | 219.20   |          | 4,16,480.00 | -          |
|       |   |       |      |          |          | -           | -          |
| 3.24  | <b>Cutting holes</b> up to 15x15 cm in R.C.C. floors and roofs for passing drain pipe etc. and repairing the hole after insertion of drain pipe etc. with cement concrete 1:2:4 (1 cement:2 coarse sand: 4 graded stone aggregate 20 mm nominal size) including finishing complete so as to make it leak proof  | Each  | 100  | 209.25   |          | 20,925.00   | -          |
|       |   |       |      |          |          | -           | -          |
| 3.25  | Providing and fixing <b>Stainless Steel pipe</b> and fitting of grade AISI 304 as per JIS standard 3448 complete with press type fitting (fitting shall be paid for separately) i/c fixing of the pipe with clamps at 1.00 m spacing including cutting and making good the walls including testing of joints complete as per direction of Engineer-in-charge. (The pipe length inserted in the fitting shall not be measured for payment) for RO supply to Lab 7 water cooler |       |      |          |          | -           | -          |
|       | Internal work Concealed in wall   |       |      |          |          | -           | -          |
| a)    | 15.88 mm outer dia pipe   | Metre | 50   | 255.00   |          | 12,750.00   | -          |
| b)    | 22.22 mm outer dia Pipe   | Metre | 50   | 391.60   |          | 19,580.00   | -          |
| c)    | 28.58 mm outer dia Pipe   | Metre | 135  | 477.25   |          | 64,428.75   | -          |
| d)    | 34.00 mm outer dia pipe   | Metre | 55   | 645.60   |          | 35,508.00   | -          |
| e)    | 42.70 mm outer dia pipe   | Metre | 275  | 666.60   |          | 1,83,315.00 | -          |
| f)    | 48.60 mm outer dia pipe   | Metre | 190  | 794.65   |          | 1,50,983.50 | -          |
|       |   |       |      |          |          | -           | -          |

| S. No | Item Description   | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount  | NSR Amount |
|-------|--|-------|-----|----------|----------|-------------|------------|
| 1     | 2  | 3     | 4   | 5        | 6        | 7           | 8          |
| 3.26  | Providing and fixing Stainless Steel pipe and fitting of grade AISI 304 as per JIS standard 3448 complete with press type fitting (fitting shall be paid for separately) i/c fixing of the pipe with clamps at 1.00 m spacing including cutting and also including cutting and chasing of wall making and good the walls including testing of joints complete as per direction of Engineer -in-charge. (The pipe length inserted in the fitting shall not be measured for payment) |       |     |          |          | -           | -          |
|       | <b>Internal work Concealed in wall</b>   |       |     |          |          | -           | -          |
| a)    | 15.88 mm outer dia pipe  | Meter | 400 | 348.30   |          | 1,39,320.00 | -          |
| b)    | 22.22 mm outer dia pipe  | Meter | 180 | 484.90   |          | 87,282.00   | -          |
|       |  |       |     |          |          | -           | -          |
| 3.27  | Providing and fixing required <b>Stainless Steel Fitting of press fit</b> design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.  |       |     |          |          | -           | -          |
|       | <b>Coupling/Socket</b>   |       |     |          |          | -           | -          |
| a)    | 15.88 mm outer dia pipe  | Each  | 135 | 48.80    |          | 6,588.00    | -          |
| b)    | 22.22 mm outer dia pipe  | Each  | 60  | 73.15    |          | 4,389.00    | -          |
| c)    | 28.58 mm outer dia pipe  | Each  | 45  | 103.55   |          | 4,659.75    | -          |
| d)    | 34.00 mm outer dia pipe  | Each  | 20  | 152.15   |          | 3,043.00    | -          |
| e)    | 42.70 mm outer dia pipe  | Each  | 95  | 183.50   |          | 17,432.50   | -          |
| f)    | 48.60 mm outer dia pipe  | Each  | 65  | 209.05   |          | 13,588.25   | -          |
|       |  |       |     |          |          | -           | -          |
| 3.28  | Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.       |       |     |          |          | -           | -          |
|       | <b>Reducer</b>   |       |     |          |          | -           | -          |
| a)    | For 22.22 mm x 15.88 mm outer dia pipe   | Each  | 56  | 119.65   |          | 6,700.40    | -          |
| b)    | For 28.58 mm x 15.88 mm outer dia pipe   | Each  | 109 | 163.75   |          | 17,848.75   | -          |
| c)    | For 28.58 mm x 22.22 mm outer dia pipe   | Each  | 10  | 168.40   |          | 1,684.00    | -          |
| d)    | For 34.00 mm x 28.58 mm outer dia pipe   | Each  | 10  | 220.70   |          | 2,207.00    | -          |
| e)    | For 42.70 mm x 15.88 mm outer dia pipe   | Each  | 56  | 417.00   |          | 23,352.00   | -          |
|       |  |       |     |          |          | -           | -          |
| 3.29  | Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.   |       |     |          |          | -           | -          |
|       | <b>Elbow 90o</b>   |       |     |          |          | -           | -          |
| a)    | 15.88 mm outer dia pipe  | Each  | 145 | 67.35    |          | 9,765.75    | -          |
| b)    | 22.22 mm outer dia pipe  | Each  | 15  | 73.15    |          | 1,097.25    | -          |
| c)    | 28.58 mm outer dia pipe  | Each  | 30  | 111.50   |          | 3,345.00    | -          |
| d)    | 34.00 mm outer dia pipe  | Each  | 7   | 126.60   |          | 886.20      | -          |
|       |  |       |     |          |          | -           | -          |



| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate  | DSR Amount | NSR Amount  |
|-------|---|------|-----|----------|-----------|------------|-------------|
| 1     | 2   | 3    | 4   | 5        | 6         | 7          | 8           |
| 3.30  | Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M- profile and with O-ring sealing gasket of EPDM material of required dia as per dirction of Engineer-in-charge.  |      |     |          |           | -          | -           |
|       | <b>Equal Tee</b>  |      |     |          |           | -          | -           |
| a)    | 15.88 mm outer dia pipe   | Each | 25  | 184.70   |           | 4,617.50   | -           |
| b)    | 22.22 mm outer dia pipe   | Each | 25  | 268.30   |           | 6,707.50   | -           |
| c)    | 28.58 mm outer dia pipe   | Each | 28  | 317.10   |           | 8,878.80   | -           |
| d)    | 34.00 mm outer dia pipe   | Each | 35  | 507.60   |           | 17,766.00  | -           |
|       |   |      |     |          |           | -          | -           |
| 3.31  | Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M- profile and with O-ring sealing gasket of EPDM material of required dia as per dirction of Engineer-in-charge.  |      |     |          |           | -          | -           |
|       | <b>Female Threaded Elbow</b>  |      |     |          |           | -          | -           |
| a)    | For 15.88 mm outer dia x 15 mm nominal dia threaded   | Each | 109 | 174.25   |           | 18,993.25  | -           |
|       |   |      |     |          |           | -          | -           |
| 3.32  | Providing and fixing pressure reducing valve with strainer delivering desired rate of flow with flanged connection. The complete system is tested to a pressure not less than 15 Kg / Sq.cm and suitable to reduce the pressure upto 1 Kg/Sq.cm) including flanges / unions, nuts, bolts, 1# Pressure gauge complete as required. |      |     |          |           | -          | -           |
| a)    | 15 mm dia   | Each | 2   |          | 5,045.00  | -          | 10,090.00   |
| b)    | 20 mm dia   | Each | 2   |          | 5,684.00  | -          | 11,368.00   |
| c)    | 25 mm dia   | Each | 2   |          | 5,947.00  | -          | 11,894.00   |
| d)    | 32 mm dia   | Each | 4   |          | 8,708.00  | -          | 34,832.00   |
| e)    | 40 mm dia   | Each | 4   |          | 10,514.00 | -          | 42,056.00   |
| f)    | 50 mm dia   | Each | 4   |          | 15,368.00 | -          | 61,472.00   |
|       |   |      |     |          |           | -          | -           |
| 3.33  | Providing and fixing <b>Ball valve (SS)</b> as per specifications of PN 10 rating.  |      |     |          |           | -          | -           |
| a)    | 25 mm   | Each | 38  |          | 2,313.00  | -          | 87,894.00   |
| b)    | 32 mm   | Each | 10  |          | 3,762.00  | -          | 37,620.00   |
| c)    | 40 mm   | Each | 10  |          | 3,887.00  | -          | 38,870.00   |
| d)    | 50 mm   | Each | 10  |          | 5,885.00  | -          | 58,850.00   |
|       |   |      |     |          |           | -          | -           |
| 3.34  | Providing and fixing Indian make CP brass <b>air valves</b> with gunmetal isolation valve fixed on pipe lines.  |      |     |          |           | -          | -           |
| a)    | 15mm n.b air vent with 15mm isolation valve.  | Each | 120 |          | 2,623.00  | -          | 3,14,760.00 |
| b)    | 20mm n.b air vent with 20mm isolation valve.  | Each | 130 |          | 3,135.00  | -          | 4,07,550.00 |
| c)    | 40mm n.b air vent with 20mm isolation valve.  | Each | 65  |          | 5,028.00  | -          | 3,26,820.00 |
|       |   |      |     |          |           | -          | -           |
| 3.35  | Providing and Fixing concealed Bath & Shower Mixer and diverter cutting and making good the wall complete as per instructions of the engineer-in-charge. Code No FLR-CHR-5273UPR from Jaquar or equivalent make   | Each | 128 |          | 5,610.20  | -          | 7,18,105.37 |
|       |   |      |     |          |           | -          | -           |

| S. No | Item Description   | Unit  | Qty    | DSR Rate | NSR Rate | DSR Amount | NSR Amount   |
|-------|--|-------|--------|----------|----------|------------|--------------|
| 1     | 2  | 3     | 4      | 5        | 6        | 7          | 8            |
| 3.36  | Providing and fixing O/H Shower ø100mm, Round Shape Single Flow, (ABS Body Chrome Plated with Gray Face Plate) with Rubit Cleaning System Shower Arm ø20mm & 450mm Long Round Shape with 90° Bend For Wall Mounted Showers with Flange. Code No OHS-CHR-1989 and SHA-CHR-479L450 from Jaquar or equivalent make  | Each  | 128    |          | 3,557.11 | -          | 4,55,310.64  |
|       |  |       |        |          | -        | -          | -            |
| 3.37  | Providing and Fixing CP Bath spout with wall flange having aerators/flow restrictor to achieve the desired flowrate complete as per instructions of the engineer-in-charge or as per equivalent make. (Flowrate : 8.4 LPM at 45 Psi pressure)  | Each  | 128    |          | 1,965.09 | -          | 2,51,532.10  |
|       |  |       |        |          | -        | -          | -            |
| 3.38  | Providing fixing testing and commissioning of <b>CP brass wall/counter mounted sink mixer</b> with C.P. wall flange, overhead swinging spout/goose neck complete as required having aerator/flow restrictor to achieve the desired flow rate and making good including necessary wall cutting/chasing and making as required as per direction of engineer in_charge( flowrate:6.4 LPM at Psi Pressure)   | Each  | 556    |          | 4,553.15 | -          | 25,31,553.24 |
|       |  |       |        |          | -        | -          | -            |
| 3.39  | Providing and fixing CP Brass <b>single lever basin mixer with Swinging spout</b> (Table Mounted) with 450 mm long braided hoses of approved quality confirming to IS :8931. Code no. FLR-CHR-5173B from Jaquar or equivalent make.  | Each  | 125    |          | 3,902.85 | -          | 4,87,856.71  |
|       |  |       |        |          | -        | -          | -            |
| 3.39  | Providing fixing testing and commissioning of <b>CP brass laboratory cock C.P brass swain makes with delux knob 3 way counter mounted lab sink</b> with C.P. flange, complete as required including necessary wall cutting/chasing and making as required as per direction of engineer in_charge( code no. 1284 Vijaya make or equivalent approved make)   | Each  | 50     |          | 1,888.84 | -          | 94,441.86    |
|       |  |       |        |          | -        | -          | -            |
| 3.40  | Providing and fixing closed cell <b>polyolefin tube type</b> thermal insulation over hot water pipes with thermal conductivity not exceeding 0.034 w/mk. At an average temp of 0 degree c , having density of material as 30 kg/m3 , with operating range of -80 degree C to +95 degree C, hcfc- free including all required accessories complete as per manufactur"s specifications for the following pipe sizes and finishing it as per site requirement.(Hot water supply/return pipes) |       |        |          |          | -          | -            |
| a)    | 15 mm dia  | Metre | 5325   |          | 42.00    | -          | 2,23,650.00  |
| b)    | 20 mm dia  | Metre | 3000   |          | 51.00    | -          | 1,53,000.00  |
| c)    | 25 mm dia  | Metre | 1965   |          | 76.00    | -          | 1,49,340.00  |
| d)    | 32 mm dia  | Metre | 950    |          | 91.00    | -          | 86,450.00    |
| e)    | 40 mm dia  | Metre | 551.25 |          | 223.00   | -          | 1,22,928.75  |
| f)    | 50 mm dia  | Metre | 668.75 |          | 300.00   | -          | 2,00,625.00  |
| g)    | 65 mm dia  | Metre | 200    |          | 350.00   | -          | 70,000.00    |
| h)    | 80 mm dia  | Metre | 150    |          | 394.00   | -          | 59,100.00    |
|       |  |       |        |          | -        | -          | -            |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate    | DSR Amount | NSR Amount   |
|-------|--|------|-----|----------|-------------|------------|--------------|
| 1     | 2  | 3    | 4   | 5        | 6           | 7          | 8            |
| 3.41  | Supplying, fixing, testing and commissioning of storage type water heater (Geyser) etc. with outer body of ABS, 2 MM Thick Mild Steel inner Tank with glass line coating,option of 1/2/3 KW electrically operated single phase 230V, including Glass Lined Double Heating Element,Digital Display, Multifunction Safety Device, ELCB, Anode Rod System, and Brackets for fixing on wall with connecting Wire & plug etc. conforming to IS: 2082 and energy efficient star rated model.   |      |     |          |             | -          | -            |
| a)    | 15 Litre Capacity  | Each | 111 |          | 7,653.00    | -          | 8,49,483.00  |
| b)    | 25 Litre Capacity  | Each | 12  |          | 7,807.00    | -          | 93,684.00    |
| c)    | 35 litre capacity  | Each | 25  |          | 9,368.00    | -          | 2,34,200.00  |
|       |  |      |     |          |             | -          | -            |
| 3.42  | Providing & fixing <b>water storage cooler</b> of approved make and brand with SS body Complete in respects-230V Single Phase. (Voltas/Shriram/BLUE-STAR)  |      |     |          |             | -          | -            |
| a)    | minimum flow rate of 40 ltrs. Per hour and storage capacity 80 ltrs.   | Each | 93  |          | 32,836.00   | -          | 30,53,748.00 |
|       |  |      |     |          |             | -          | -            |
| 3.43  | Providing and fixing approved make & suitable model of <b>R.O. plant 100 ltrs.</b> Per hour flow rate having capacity to treat the raw water having TDS 1200 ppm and not less than 40%. The treated water should have TDS less than 100 ppm and hardness less than 50 ppm. The operating voltage to 230 volt AC +/- 10% alongwith required capacity pump and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, hydro pneumatic tank, over voltage and over current protection with switch mode power supply system antiscaling dosing system complete in all respects including installation and fittings with the following provisions: (IONIEXCHANGE/ KENT/AQUAPROCESS/Pantair )   |      |     |          |             | -          | -            |
|       | 10 micron polypropylene sediment pre filter  |      |     |          |             | -          | -            |
|       | 10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating   |      |     |          |             | -          | -            |
|       | 3 Nos. of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type   |      |     |          |             | -          | -            |
|       | UV lamp of minimum capacity 100 LPM and minimum lamp wattage 9W  | Each | 2   |          | 1,22,343.00 | -          | 2,44,686.00  |
|       |  |      |     |          |             | -          | -            |
| 3.44  | Providing and fixing approved make & suitable model of <b>R.O. plant</b> (fully automatic operation) <b>600ltrs.</b> Per hour flow rate having capacity to treat the raw water and average recovery not less than 35% . The operating voltage to 230 volt AC +/- 10% alongwith required capacity on line SS pump of approved make (3HP minimum) and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, storage tank (3.0 mm (minimum) thick S.S. 304 sheet) 1500 lts of suitable size and ita supporting structure, over voltage and over current protection with switch mode power supply system complete in all respects including installation and fittings with the following provisions: (IONIEXCHANGE/ KENT/AQUAPROCESS,Pantair ) |      |     |          |             | -          | -            |
|       | 10 micron polypropylene sediment pre filter  |      |     |          |             | -          | -            |

| S. No | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate     | DSR Amount            | NSR Amount            |
|-------|---|-------|------|----------|--------------|-----------------------|-----------------------|
| 1     | 2   | 3     | 4    | 5        | 6            | 7                     | 8                     |
|       | 10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating  |       |      |          |              | -                     | -                     |
|       | Required Nos. and size of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type  |       |      |          |              | -                     | -                     |
|       | UV lamp of minimum capacity 600LPH and minimum lamp wattage 15W   |       |      |          |              | -                     | -                     |
|       | MS powder coated frame efficient of TDS removal more than 90%. Antiscalant dosing and acid dosing system for self flushing/cleaning.Pressure switches and gauges, pH correction dosing system, Digital TDS meter, Digital pH meter, electric panel and necessary instrumentation included Rotameter.MS structure and fibre glass sheet weather protection cover as per site condition.  | Each  | 14   |          | 2,83,276.00  | -                     | 39,65,864.00          |
|       |   |       |      |          |              | -                     | -                     |
| 3.45  | Providing and fixing approved make & suitable model of R.O. plant (fully automatic operation) 2000 ltrs. Per hour flow rate having capacity to treat the raw water and average recovery not less than 35% . The operating voltage to 230 volt AC +/- 10% along with required capacity on line SS pump of approved make (3HP minimum) and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, storage tank (3.0 mm (minimum) thick S.S. 304 sheet) 1500 lts of suitable size and its supporting structure, over voltage and over current protection with switch mode power supply system complete in all respects including installation and fittings with the following provisions: (IONIEXCHANGE/ KENT/AQUAPROCESS,Pantair ) |       |      |          |              | -                     | -                     |
|       | 10 micron polypropylene sediment pre filter   |       |      |          |              | -                     | -                     |
|       | 10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating  |       |      |          |              | -                     | -                     |
|       | Required Nos. and size of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type  |       |      |          |              | -                     | -                     |
|       | UV lamp of minimum capacity 1500LPH and minimum lamp wattage 15W  |       |      |          |              | -                     | -                     |
|       | MS powder coated frame efficient of TDS removal more than 90%. Antiscalant dosing and acid dosing system for self flushing/cleaning.Pressure switches and gauges, pH correction dosing system, Digital TDS meter, Digital pH meter, electric panel and necessary instrumentation included Rotameter.MS structure and fibre glass sheet weather protection cover as per site condition.  | Each  | 11   |          | 15,22,745.00 | -                     | 1,67,50,195.00        |
|       |   |       |      |          |              | -                     | -                     |
|       | <b>SUB TOTAL(Water Supply)</b>  |       |      |          |              | <b>1,92,46,072.51</b> | <b>4,69,72,328.65</b> |
| 4.00  | <b>SEWARAGE &amp; DRAINAGE (AROUND THE BUILDING)</b>  |       |      |          |              |                       | -                     |
| 4.01  | Providing laying and jointing glazed stoneware pipes grade 'A' with stiff mixture of cement mortar in the pro-portion of 1:1 (1 cement : 1 fine sand) including testing of joints etc. complete.  |       |      |          |              |                       | -                     |
| a)    | 100 mm diameter S.W. Pipe   | Metre | 50   | 216.25   |              | 10,812.50             | -                     |
| b)    | 150 mm diameter S.W. Pipe   | Metre | 1200 | 327.05   |              | 3,92,460.00           | -                     |
|       |   |       |      |          |              | -                     | -                     |

| S. No | Item Description   | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount |
|-------|--|-------|------|----------|----------|--------------|------------|
| 1     | 2  | 3     | 4    | 5        | 6        | 7            | 8          |
| 4.02  | Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design:  |       |      |          |          | -            | -          |
| a)    | 100 mm diameter S.W. pipe/RCC NP2  | Metre | 50   | 622.95   |          | 31,147.50    | -          |
| b)    | 150 mm diameter S.W. pipe/RCC NP2  | Metre | 2650 | 761.85   |          | 20,18,902.50 | -          |
|       |  |       |      |          |          | -            | -          |
| 4.03  | Providing and laying cement concrete 1:5:10 (1 cement:5 coarse sand:10 graded stone aggregate 40 mm nominal size) up to haunches of S.W. pipes including bed concrete as per standard design:  |       |      |          |          | -            | -          |
| a)    | 300 mm diameter S.W. pipe  | Metre | 450  | 757.60   |          | 3,40,920.00  | -          |
|       |  |       |      |          |          | -            | -          |
| 4.04  | Providing and fixing square-mouth S.W. gully trap grade 'A' complete with C.I. grating, brick masonry chamber with water tight C.I. cover with frame of 300x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design.:  |       |      |          |          | -            | -          |
| a)    | 150x100mm size P type  |       |      |          |          | -            | -          |
| a.i)  | F.P.S. Bricks class designation 75   | Each  | 112  | 1,623.25 |          | 1,81,804.00  | -          |
|       |  |       |      |          |          | -            | -          |
| 4.05  | Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement:2 fine sand) including testing of joints etc. complete   |       |      |          |          | -            | -          |
| a)    | 150 mm dia R.C.C. pipe   | Metre | 1450 | 356.70   |          | 5,17,215.00  | -          |
| b)    | 300 mm dia R.C.C. pipe   | Metre | 450  | 482.05   |          | 2,16,922.50  | -          |
|       |  |       |      |          |          | -            | -          |
| 4.06  | Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand), R.C.C. top slab with 1:2:4 mix ( 1cement : 2 coarse sand : 4graded stone aggregate 20 mm nominal size ), foundation concrete 1:4:8 ( 1cement : 4 coarse sand : 8graded stone aggregate 40 mm nominal size ), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, and making necessary channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement all complete as per standard design. |       |      |          |          | -            | -          |
| a)    | Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg):   |       |      |          |          | -            | -          |
| a i)  | With F.P.S. bricks with class designation 75   | Each  | 600  | 8,634.10 |          | 51,80,460.00 | -          |
|       |  |       |      |          |          | -            | -          |
| 4.07  | Extra depth for manholes   |       |      |          |          | -            | -          |
| a)    | Size 90 x 80 cm  |       |      |          |          | -            | -          |
| a i)  | With F.P.S. bricks class designation 75  | Metre | 133  | 5,718.60 |          | 7,60,573.80  | -          |
|       |  |       |      |          |          | -            | -          |

| S. No | Item Description   | Unit  | Qty  | DSR Rate  | NSR Rate | DSR Amount  | NSR Amount  |
|-------|--|-------|------|-----------|----------|-------------|-------------|
| 1     | 2  | 3     | 4    | 5         | 6        | 7           | 8           |
| 4.07  | Constructing brick masonry manhole in cement mortar 1:4 ( 1 cement : 4 coarse sand ) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design :   |       |      |           |          | -           | -           |
|       |  |       |      |           |          | -           | -           |
| 4.08  | Inside size 120x90 cm and 90 cm deep including C.I. cover with frame (medium duty) 500 mm internal diameter, total weight of cover and frame to be not less than 116 kg (weight of cover 58 kg and weight of frame 58 kg) :  |       |      |           |          | -           | -           |
| a)    | With common burnt clay F.P.S. (non modular) bricks of class designation 7.5  | Each  | 18   | 18,422.00 |          | 3,31,596.00 | -           |
|       |  |       |      |           |          | -           | -           |
| 4.09  | Providing and fixing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS: 1786 having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design. | Each  | 1321 | 327.90    |          | 4,33,155.90 | -           |
|       |  |       |      |           |          | -           | -           |
| 4.10  | Making connection of drain or sewer line with existing manhole including breking into and making good the walls, floors with cement concrete 1:2:4 mix (1 cement:2 coarse sand:4 graded stone aggregate 20 mm nominal size) cement plastered on both sides with cemnet mortar 1:3 (1 cement:3 coarse sand) finished with a floating coat of neat cement and making necessary channels for the drain etc. complete (including obtaining approval from DJB/Municipal corporation   |       |      |           |          | -           | -           |
| a)    | For pipes 100 to 250 mm dia  | Each  | 9    | 391.15    |          | 3,520.35    | -           |
|       |  |       |      |           |          | -           | -           |
| 4.11  | Providing and laying Laboratory/hospital effluent waste pipe and fitting of high density polyethelene (HDPE),CLASS -PE 80 ,pressure rating PN-6,conforming to IS :4427, electric fusion joints/flanged joints , fittings and jointing  |       |      |           |          | -           | -           |
| a)    | 160 mm dia   | Meter | 100  |           | 2,013.00 | -           | 2,01,300.00 |
| b)    | 200 mm dia   | Meter | 100  |           | 3,124.00 | -           | 3,12,400.00 |
|       |  |       |      |           |          | -           | -           |

| S. No       | Item Description   | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount            | NSR Amount          |
|-------------|--|-------|-----|----------|----------|-----------------------|---------------------|
| 1           | 2  | 3     | 4   | 5        | 6        | 7                     | 8                   |
| 4.12        | Constructing brick masonry road gully chamber 50x45x60 cm with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design :   |       |     |          |          | -                     | -                   |
| a)          | With common burnt clay F.P.S. (non modular) bricks of class designation 7.5  | Each  | 450 | 4,043.10 |          | 18,19,395.00          | -                   |
|             |  |       |     |          |          | -                     | -                   |
| 4.13        | Supply of Grease separator of approved model and make HDPE body with sludge trap capacity 5000 Ltrs./hr according to DIN EN 1825, for free standing installation, of polyethylene, material LLD-PE, with grease storage capacity 1000 liters(min.), total wastewater capacity 4000 liters(min.), with direct suction, with connecting flange DN 65 PN 10 .   |       |     |          |          | -                     | -                   |
|             | For local suction line 65/80 mm dia(min.), with fire hose quick coupling with 2 odour proof maintenance openings DN 350 inlet and outlet<br>With approx. dimensions: 2000x2700x1800mm<br>With Inspection Windows & Filling Device.<br>(Make : ACO /Kessel or approved equivalent) including<br>2nos DP /grundfos pump of required capacity (1 working+1 standby), SS motor casing; SS shaft, C.lbody, SS.-impeller,1500rpm with the flow rate of 10-15lps at 12mts head, Solid handling capacity of pump is 12 mm.Electrical Control Panel for Contactor, relay, overload relay , TPMCB for each pump, cyclic timer, TPN for main, R-Y-B Indication, transformer -24-volts;voltmeter, volt selector switch, auto manual switch, 2-push button set, on-trip lights, terminal blocks ;channal and kit complete set; legend plate; powder coated box. |       |     |          |          |                       | -                   |
|             | With float switch for water level sensing & dry running protection including Grease and sludge Transfer Pump screw type of approved make and model complete in all respect with intermediate sludge PVC storage tank 5000 Ltrs (min.) complete in all respect with pipe and fitting etc. as per instruction of Engineer in charge. The civil cost will be paid under civil work as per approved drawings and detail designs.   | Set   | 5   |          |          | 15,50,414.00          | 77,52,070.00        |
|             |  |       |     |          |          |                       | -                   |
|             | <b>SUB TOTAL(Sewerage , Storm &amp; Drainage)</b>  |       |     |          |          | <b>1,22,38,885.05</b> | <b>82,65,770.00</b> |
| <b>5.00</b> | <b>SOLAR WATER HEATING SYSTEM</b>  |       |     |          |          |                       | -                   |
|             |  |       |     |          |          |                       | -                   |
| 5.01        | Providing and fixing G.I.fittings and clamps,i/c cutting and making good the walls etc.  |       |     |          |          |                       | -                   |
|             | <b>Internal work - Exposed on wall</b>   |       |     |          |          | -                     | -                   |
|             |  |       |     |          |          | -                     | -                   |
| a)          | 25 mm nominal bore   | Meter | 275 | 247.85   |          | 68,158.75             | -                   |
| b)          | 32 mm nominal bore   | Meter | 180 | 308.35   |          | 55,503.00             | -                   |
| c)          | 40 mm nominal bore   | Meter | 290 | 394.15   |          | 1,14,303.50           | -                   |
| d)          | 50mm nominal bore  | Meter | 376 | 472.40   |          | 1,77,622.40           | -                   |
| e)          | 65 mm nominal bore   | Meter | 315 |          | 567.00   | -                     | 1,78,605.00         |
|             |  |       |     |          |          | -                     | -                   |

| S. No | Item Description  | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|-------|-----|----------|----------|------------|------------|
| 1     | 2   | 3     | 4   | 5        | 6        | 7          | 8          |
| 5.02  | <b>Insulation of G.I.piping</b> with aluminium clad mineral fibre glass insulation suitable for outdoor applications suitable for following pipe sizes  |       |     |          |          | -          | -          |
| a)    | 25 dia  | Meter | 275 |          | 119.00   | -          | 32,725.00  |
| b)    | 32 dia  | Meter | 180 |          | 135.00   | -          | 24,300.00  |
| c)    | 40 dia  | Meter | 290 |          | 210.00   | -          | 60,900.00  |
| d)    | 50 dia  | Meter | 376 |          | 228.00   | -          | 85,728.00  |
| e)    | 65 dia  | Meter | 315 |          | 280.00   | -          | 88,200.00  |
|       |   |       |     |          |          | -          | -          |
| 5.03  | Providing & fixing 9 mm thick thermal insulation tubing of elastomeric flexible material having hermetic blistered closed cell structure of expanded synthetic rubber over pipes/ fitting as per manufacturer's specifications etc.complete with aluminium cladding over insulated tubing.  |       |     |          |          | -          | -          |
| a)    | 15 mm dia to 25 mm dia  | Each  | 50  |          | 110.00   | -          | 5,500.00   |
| b)    | 32 mm dia to 50 mm dia  | Each  | 50  |          | 375.00   | -          | 18,750.00  |
| c)    | 65 mm dia to 80 mm dia  | Each  | 50  |          | 481.00   | -          | 24,050.00  |
|       |   |       |     |          |          | -          | -          |
| 5.04  | <b>Supply, installation, testing and commissioning of solar water heating system, Thermosyphon type, all complete based on Flat plat collector system (Cu-Cu Type only) comprising of but not limited to the following:</b>   |       |     |          |          | -          | -          |
|       |   |       |     |          |          | -          | -          |
|       | Requisite number of Flat plate collectors of 2.30 sq. mtr. collector area. Collector absorber plate to be made of copper tubes & copper fins only   |       |     |          |          | -          | -          |
|       |   |       |     |          |          | -          | -          |
|       | Hot water storage tank made of stainless steel 304- food grade quality minimum <b>3mm</b> thick with 2 coats of 3M epoxy anti corrosive paint inside the tank with 100 mm Glass wool insulation and cladding with 24 SWG Aluminum sheet. One temperature measuring device and suitable inlet, outlet and drain connections on the storage tank to be provided. Suitable Electrical Heater backup to be provided inside the tank along with thermostat |       |     |          |          | -          | -          |
|       |   |       |     |          |          | -          | -          |
|       | Heat Exchanger - plate type external heat exchanger of SS316 plates (make Gea echo flex/Alfalavel/transter ) with MS Flanges for transfer of heat minimum 1000 K Calories/collector/hr with necessary pressure guage and temperature guage and isolation valve etc. complete . Suitable make up tank for the Heat Exchanger circuit shall also be provided  |       |     |          |          | -          | -          |
|       |   |       |     |          |          | -          | -          |
|       | Interconnecting system piping shall consist of B Class insulated GI/CPVC pipes covered with 50mm thick glasswool & clad with 26 SWG Aluminium Sheet. All Gate/Ball valves shall be of ISI make.   |       |     |          |          | -          | -          |
|       |   |       |     |          |          | -          | -          |



| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate     | DSR Amount | NSR Amount     |
|-------|---|------|-----|----------|--------------|------------|----------------|
| 1     | 2   | 3    | 4   | 5        | 6            | 7          | 8              |
|       | Electrical control panel, cabling from panel to pumps shall also be provided, Electrical panel:16 SWG sheet powder coated electrical panel for outdoor application IP-65, with Digital differential temperature controller for automatic ON/OFF at primary and secondary pumps (3ph) with necessary contractors, relays, control fuse, isolation switches. The cable beyond 100 m if required will be paid seperately in electrical head.   |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |
|       | The solar collector shall be arranged on roof of building in such a way that shadow can be avoided and requisite number of MS support for collector/tanks of minimum 40x40x5 MS angle adequate for 150 Km/Hr wind speed.  |      |     |          |              | -          | -              |
|       | Primary & Secondary Pumps between Collector and Heat Exchanger---Providiing of Recirculation Pumps (between Collectors and Heat Exchanger) with SS Impellers and Shaft for Temperature Application upto 90 Deg.C of Required Flow 100 Ltrs./Collector for Minimum Pressure drop of 2 Kg./Cm2 with Isolation Valves, NRVs and Stainer(1W+1S) Pumps.  |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |
|       | Solar water heating system based on Flat plat collector systmem technology with output capacity of as mentioned below with hot water at 60 degree centigrade having reqired Nos. solar collectors as per complete item as per technical specification of make BHEL/TATA/EMMVEE/INTER-SOLAR. The system has to be installed by Manufacturers authorised distributors/approved specialised firms of Solar water heating of approved makeThe shop drawing of the systems shall be provided by the agency as per site condition obtain the proper efficiency The system shall be procured after obtaining the approval of shop drawings from HSCC / Engineer-in-charge.(Electric heating element shall not be provided in the system as the solar hot water system will supply the hot water to the individual geyser). |      |     |          |              | -          | -              |
|       | Supply, Installation, Testing and commissioning of the system complete with necessary Temperature gauge, Temperature sensor, Thermostat with rubber gaskets, Electrical & Control wiring  |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |
|       | <b>Complete Solar System as mentioned above for Capcity 5000 Litre/day (With minimum 38 nos of Collect) of 2.30 Sqm area</b>  | Each | 12  |          | 15,82,072.00 | -          | 1,89,84,864.00 |
|       |   |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |
| 5.05  | <b>Supply, installation, testing and commissioning of solar water heating system, Thermosyphon type, all complete based on Flat plat collector system (Cu-Cu Type only) comprising of but not limited to the following:</b>   |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |
|       | Requisite number of Flat plate collectors of 2.30 sq. mtr. collector area. Collector absorber plate to be made of copper tubes & copper fins only   |      |     |          |              | -          | -              |
|       |   |      |     |          |              | -          | -              |

| S. No       | Item Description   | Unit | Qty | DSR Rate | NSR Rate    | DSR Amount         | NSR Amount            |
|-------------|--|------|-----|----------|-------------|--------------------|-----------------------|
| 1           | 2  | 3    | 4   | 5        | 6           | 7                  | 8                     |
|             | Hot water storage tank made of stainless steel 304- food grade quality minimum <b>3mm</b> thick with 2 coats of 3M epoxy anti corrosive paint inside the tank with 100 mm Glass wool insulation and cladding with 24 SWG Aluminum sheet. One temperature measuring device and suitable inlet, outlet and drain connections on the storage tank to be provided. Suitable Electrical Heater backup to be provided inside the tank along with thermostat  |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | Heat Exchanger - Cage type Internal Heat Exchanger made of SS pipes shall be provided inside the Solar Tank. Heat exchangers shall have min. heat transfer area of 0.24 sq. mtrs. for every 100 LPD calacity.  |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | Interconnecting system piping shall consist of B Class insulated GI pipes covered with 50mm thick glasswool & clad with 26 SWG Aluminium Sheet. All Gate/Ball valves shall be of ISI make.   |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | Electrical control panel, cabling from panel to pumps and electrical heaters shall also be provided  |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | The solar collector shall be arranged on roof of building in such a way that shadow can be avoided and requisite number of MS support for collector/tanks of minimum 40x40x5 MS angle adequate for 150 Km/Hr wind speed.   |      |     |          |             | -                  | -                     |
|             | Solar water heating system based on Flat plat collector system technology with output capacity of as mentioned below with hot water at 60 degree centigrade having required Nos. solar collectors as per complete item as per technical specification of make BHEL/TATA/EMMVEE/ INTER-SOLAR. The system has to be installed by Manufacturers authorised distributors/approved specialised firms of Solar water heating of approved makeThe shop drawing of the systems shall be provided by the agency as per site condition obtain the proper efficiency The system shall be procured after obtaining the approval of shop drawings from HSCC / Engineer-in-charge.(Electric heating element shall not be provided in the system as the solar hot water system will supply the hot water to the individual geyser). |      |     |          |             | -                  | -                     |
|             | Supply, Installation, Testing and commissioning of the system complete with necessary Temperature gauge, Temperature sensor, Thermostat with rubber gaskets, Electrical & Control wiring   |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | <b>Complete Solar System as mentioned above for Capcity 1500 Litre/day (With minimum 12 nos of Collect) of 2.30 Sqm area</b>   | Each | 12  |          | 4,54,311.00 | -                  | 54,51,732.00          |
|             |  |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
|             | <b>SUBTOTAL(SOLAR WATER HEATING SYSTEM )</b>   |      |     |          |             | <b>4,15,587.65</b> | <b>2,49,55,354.00</b> |
| <b>6.00</b> | <b>RAIN WATER PIPING</b>   |      |     |          |             | -                  | -                     |
|             |  |      |     |          |             | -                  | -                     |
| 6.01        | Providing and fixing to the <b>inlet mouth</b> of rain water pipe cast iron grating 15/25 cm diameter and weighing not less than 440 grams   | Each | 148 | 40.90    |             | 6,053.20           | -                     |

| S. No | Item Description   | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount     |
|-------|--|-------|------|----------|----------|--------------|----------------|
| 1     | 2  | 3     | 4    | 5        | 6        | 7            | 8              |
|       |  |       |      |          |          | -            | -              |
| 6.02  | Providing and fixing <b>rain water ,soil, waste and vent pipes.</b>  |       |      |          |          | -            | -              |
| a)    | 100 mm dia.  |       |      |          |          | -            | -              |
| a.i)  | Centrifugally cast (spun) iron socketed pipe as per IS:3989  | Metre | 3750 | 921.65   |          | 34,56,187.50 | -              |
| b)    | 150 mm dia pipe as per IS:3989   | Metre | 5320 |          | 2,101.00 | -            | 1,11,77,320.00 |
| c)    | 200 mm dia pipe as per IS:3989   | Metre | 1000 |          | 3,414.00 | -            | 34,14,000.00   |
|       |  |       |      |          |          | -            | -              |
| 6.03  | Providing and fixing <b>M.S holder-bat clamps</b> of approved design to Sand Cast iron/ cast iron (spun) pipe embedded in and including cement concrete blocks 10x10x10 cm of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including cost of cutting holes and making good the walls etc. |       |      |          |          | -            | -              |
| a)    | for 100 mm dia. pipe   | Each  | 1565 | 167.35   |          | 2,61,902.75  | -              |
| b)    | for 150 mm dia pipe  | Each  | 2356 |          | 159.00   | -            | 3,74,604.00    |
| c)    | for 200 mm dia pipe  | Each  | 530  |          | 285.00   | -            | 1,51,050.00    |
|       |  |       |      |          |          | -            | -              |
| 6.04  | Providing and fixing <b>plain bend</b> of required degree.   |       |      |          |          | -            | -              |
| a)    | 100 mm   | Each  | 250  | 334.95   |          | 83,737.50    | -              |
| a.i)  | Sand cast iron S&S as per IS:3989  |       |      |          |          | -            | -              |
| b)    | 150 mm   | Each  | 220  |          | 977.00   | -            | 2,14,940.00    |
| c)    | 200 mm   | Each  | 90   |          | 2,013.00 | -            | 1,81,170.00    |
|       |  |       |      |          |          | -            | -              |
| 6.05  | Providing and fixing <b>heel rest sanitary bend.</b>   |       |      |          |          | -            | -              |
| a)    | 100 mm dia   |       |      |          |          | -            | -              |
| a.ii) | sand cast iron S&S as per IS-3989  | Each  | 325  | 370.95   |          | 1,20,558.75  | -              |
| b)    | 150 mm dia   | Each  | 250  |          | 1,174.00 | -            | 2,93,500.00    |
| c)    | 200 mm dia   | Each  | 50   |          | 1,281.00 | -            | 64,050.00      |
|       |  |       |      |          |          | -            | -              |
| 6.06  | Providing and fixing <b>collar</b>   |       |      |          |          | -            | -              |
| a)    | 100 mm   | Each  | 450  | 187.45   |          | 84,352.50    | -              |
| a.ii) | Sand cast iron S&S as per IS-3989  |       |      |          |          | -            | -              |
| b)    | 150 mm   | Each  | 525  |          | 770.00   | -            | 4,04,250.00    |
| c)    | 200 mm   | Each  | 70   |          | 1,477.00 | -            | 1,03,390.00    |
|       |  |       |      |          |          | -            | -              |
| 6.07  | Providing <b>lead caulked joints</b> to sand cast iron /centrifugally cast (spun) iron pipes and fittings of diameter:   |       |      |          |          | -            | -              |
| a)    | 100 mm   | Each  | 1568 | 309.95   |          | 4,86,001.60  | -              |
| b)    | 150 mm   | Each  | 2150 |          | 481.00   | -            | 10,34,150.00   |
| c)    | 200 mm   | Each  | 450  |          | 563.00   | -            | 2,53,350.00    |
|       |  |       |      |          |          | -            | -              |
| 6.08  | <b>Painting</b> sand cast iron / centrifugally cast (spun) iron soil, waste vent pipes and fittings with paint of any colour such as chocolate, grey, or buff etc. over a coat of primer (of approved quality) for new work:   |       |      |          |          | -            | -              |
| a)    | 100 mm diameter pipe   | Metre | 3750 | 40.65    |          | 1,52,437.50  | -              |
| b)    | 150 mm diameter pipe   | Metre | 5320 |          | 68.00    | -            | 3,61,760.00    |
| c)    | 200 mm diameter pipe   | Metre | 840  |          | 90.00    | -            | 75,600.00      |
|       |  |       |      |          |          | -            | -              |

| S. No       | Item Description   | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount          | NSR Amount            |
|-------------|--|-------|-----|----------|----------|---------------------|-----------------------|
| 1           | 2  | 3     | 4   | 5        | 6        | 7                   | 8                     |
|             | <b>SUB TOTAL(Rain Water pipe &amp; fitting)</b>  |       |     |          |          | <b>46,51,231.30</b> | <b>1,81,03,134.00</b> |
| <b>7.00</b> | <b>EXTERNAL WATER SUPPLY</b>   |       |     |          |          |                     |                       |
| 7.01        | Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. (Class -C)<br><b>(For Pump Room Etc.)</b> |       |     |          |          |                     |                       |
|             | <b>Internal work - Exposed on wall</b>   |       |     |          |          |                     |                       |
| a)          | 25 mm dia nominal bore   | Metre | 18  |          | 338.70   | -                   | 6,196.25              |
| b)          | 32 mm dia nominal bore   | Metre | 19  |          | 408.43   | -                   | 7,708.75              |
| c)          | 40 mm dia nominal bore   | Metre | 417 |          | 463.56   | -                   | 1,93,133.50           |
| d)          | 50 mm dia nominal bore   | Metre | 658 |          | 592.53   | -                   | 3,89,730.00           |
| e)          | 65 mm dia  | Metre | 210 |          | 743.25   | -                   | 1,55,836.50           |
| f)          | 80 mm dia nominal bore   | Metre | 174 |          | 893.64   | -                   | 1,55,601.00           |
| g)          | 150 mm dia nominal bore  | Metre | 281 |          | 1,224.02 | -                   | 3,44,100.00           |
| h)          | 200 mm dia nominal bore  | Metre | 508 |          | 1,767.53 | -                   | 8,98,200.00           |
| 7.02        | Providing and fixing <b>G.I. pipes</b> complete with G.I. fittings including trenching and refilling etc. <b>(External Work)</b>                             |       |     |          |          | -                   | -                     |
| a)          | 25 mm dia nominal bore   | Metre | 25  | 205.85   |          | 5,146.25            | -                     |
| b)          | 32 mm dia nominal bore   | Metre | 25  | 247.40   |          | 6,185.00            | -                     |
| c)          | 40 mm dia nominal bore   | Metre | 490 | 301.04   |          | 1,47,509.60         | -                     |
| d)          | 50 mm dia nominal bore   | Metre | 825 | 342.70   |          | 2,82,727.50         | -                     |
| e)          | 65 mm dia nominal bore   | Metre | 345 | 451.70   |          | 1,55,836.50         | -                     |
| f)          | 80 mm dia nominal bore   | Metre | 270 | 576.30   |          | 1,55,601.00         | -                     |
|             |  |       |     |          |          | -                   | -                     |
| 7.03        | Providing and fixing gunmetal gate valve with CI wheel of approved quality (Screwed end) <b>(For Garden Hydrant)</b>   |       |     |          |          | -                   | -                     |
| a)          | 25 mm NB   | Each  | 110 | 428.20   |          | 47,102.00           | -                     |
|             |  |       |     |          |          | -                   | -                     |
| 7.04        | Providing and fixing <b>gun metal non-return valve</b> of approved quality (screwed end)   |       |     |          |          | -                   | -                     |
| a)          | 25 mm nominal bore   |       |     |          |          | -                   | -                     |
| a.i)        | Horizontal   | Each  | 20  | 410.45   |          | 8,209.00            | -                     |
|             |  |       |     |          |          | -                   | -                     |
| b)          | 40 mm nominal bore   |       |     |          |          | -                   | -                     |
| b.i)        | Horizontal   | Each  | 20  | 682.85   |          | 13,657.00           | -                     |
| c)          | 50 mm nominal bore   |       |     |          |          | -                   | -                     |
| c.i)        | Horizontal   | Each  | 8   | 987.70   |          | 7,901.60            | -                     |
| d)          | 80 mm nominal bore   |       |     |          |          | -                   | -                     |
| d.i)        | Horizontal   | Each  | 10  | 2,503.10 |          | 25,031.00           | -                     |
|             |  |       |     |          |          | -                   | -                     |
| e)          | 100 mm nominal bore  |       |     |          |          | -                   | -                     |
| e.i)        | Horizontal   | Each  | 15  |          | 3,975.00 | -                   | 59,625.00             |
|             |  |       |     |          |          | -                   | -                     |
| g)          | 150 mm nominal bore  |       |     |          |          | -                   | -                     |
| g.i)        | Horizontal   | Each  | 15  |          | 6,243.00 | -                   | 93,645.00             |
|             |  |       |     |          |          | -                   | -                     |

| S. No | Item Description  | Unit  | Qty | DSR Rate  | NSR Rate | DSR Amount  | NSR Amount |
|-------|---|-------|-----|-----------|----------|-------------|------------|
| 1     | 2   | 3     | 4   | 5         | 6        | 7           | 8          |
|       |   |       |     |           |          | -           | -          |
| 7.05  | Providing and fixing <b>C.I. sluice valves</b> (with cap) complete with bolts, nuts, rubber insertions etc. (the tail pieces if required will be paid separately) :   |       |     |           |          | -           | -          |
| a)    | 100 mm diameter   |       |     |           |          | -           | -          |
|       | Class II  | Each  | 8   | 3,689.75  |          | 29,518.00   | -          |
| b)    | 150 mm diameter   |       |     |           |          | -           | -          |
|       | Class II  | Each  | 22  | 5,387.20  |          | 1,18,518.40 | -          |
| c)    | 200 mm diameter   |       |     |           |          | -           | -          |
|       | Class II  | Each  | 8   | 11,316.05 |          | 90,528.40   | -          |
|       |   |       |     |           |          | -           | -          |
| 7.06  | Constructing <b>masonry chamber 60x60x75 cm</b> , inside with 75 class designation brick work in cement mortar 1:4 (1 cement: 4 coarse sand) for sluice valve, with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement: 2 coarse sand:4 graded stone aggregate 20 mm nominal size) necessary excavation foundation concrete 1:5:10 (1 cement:5 fine sand: 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement :3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design |       |     |           |          | -           | -          |
| a)    | With F.P.S. bricks  | Each  | 8   | 6,849.60  |          | 54,796.80   | -          |
|       |   |       |     |           |          | -           | -          |
| 7.07  | Constructing <b>masonry Chamber 90x90x100 cm</b> inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size ), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size ) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design :    |       |     |           |          | -           | -          |
| a)    | With F.P.S. bricks  | Each  | 30  | 11,842.75 |          | 3,55,282.50 | -          |
|       |   |       |     |           |          | -           | -          |
| 7.08  | <b>Painting G.I. pipes</b> and fittings with two coats of anti-corrosive bitumastic paint of approved quality :   |       |     |           |          | -           | -          |
| a)    | 25 mm dia nominal bore  | Metre | 25  | 9.10      |          | 227.50      | -          |
| b)    | 32 mm dia nominal bore  | Metre | 25  | 10.85     |          | 271.25      | -          |
| c)    | 40 mm dia nominal bore  | Metre | 490 | 12.35     |          | 6,051.50    | -          |
| d)    | 50 mm dia nominal bore  | Metre | 825 | 14.80     |          | 12,210.00   | -          |
| e)    | 65 mm dia nominal bore  | Metre | 345 | 18.25     |          | 6,296.25    | -          |
| f)    | 80 mm dia nominal bore  | Metre | 270 | 21.20     |          | 5,724.00    | -          |
|       |   |       |     |           |          | -           | -          |
| 7.09  | Providing and filling sand of grading zone V or coarser grade, allround the G.I. pipes in external work :   |       |     |           |          | -           | -          |
| a)    | 25 mm dia nominal bore  | Metre | 25  | 69.25     |          | 1,731.25    | -          |

| S. No | Item Description   | Unit   | Qty  | DSR Rate  | NSR Rate | DSR Amount   | NSR Amount |
|-------|--|--------|------|-----------|----------|--------------|------------|
| 1     | 2  | 3      | 4    | 5         | 6        | 7            | 8          |
| b)    | 32 mm dia nominal bore   | Metre  | 25   | 71.30     |          | 1,782.50     | -          |
| c)    | 40 mm diameter pipe  | Metre  | 490  | 72.25     |          | 35,402.50    | -          |
| d)    | 50 mm diameter pipe  | Metre  | 825  | 74.95     |          | 61,833.75    | -          |
| e)    | 65 mm diameter pipe  | Metre  | 345  | 118.30    |          | 40,813.50    | -          |
| f)    | 80 mm dia nominal bore   | Metre  | 270  | 121.90    |          | 32,913.00    | -          |
|       |  |        |      |           |          | -            | -          |
| 7.10  | Providing and fixing <b>G.I. Union</b> in existing G.I. pipe line, cutting and threading the pipe and making long screws including excavation, refilling the earth or cutting of wall and making good the same complete wherever required: |        |      |           |          | -            | -          |
| a)    | 20 mm nominal bore   | Each   | 10   | 389.40    |          | 3,894.00     | -          |
| b)    | 25 mm nominal bore   | Each   | 10   | 424.30    |          | 4,243.00     | -          |
| c)    | 32 mm nominal bore   | Each   | 170  | 459.15    |          | 78,055.50    | -          |
| d)    | 50 mm diameter pipe  | Each   | 280  | 682.85    |          | 1,91,198.00  | -          |
| e)    | 80 mm diameter pipe  | Each   | 120  | 996.45    |          | 1,19,574.00  | -          |
|       |  |        |      |           |          | -            | -          |
| 7.11  | Providing and fixing <b>C.I. double acting air valve</b> of approved quality with bolts, nuts, rubber insertions etc. complete (The tail pieces, tapers etc. if required will be paid separately):   |        |      |           |          | -            | -          |
| a)    | 50 mm dia  | Each   | 30   | 4,662.45  |          | 1,39,873.50  | -          |
| b)    | 80 mm dia  | Each   | 20   | 5,649.75  |          | 1,12,995.00  | -          |
|       |  |        |      |           |          | -            | -          |
| 7.12  | Providing and fixing enclosed type <b>water meter</b> ( bulk type) conforming to IS : 2373 and tested by municipal board complete with bolts,nuts rubber, insertions etc. ( the tail plases if required will be paid seperatly )           |        |      |           |          | -            | -          |
| a)    | 80 mm nominal bore   | Each   | 1    | 3,104.50  |          | 3,104.50     | -          |
| b)    | 100 mm nominal bore  | Each   | 1    | 4,638.60  |          | 4,638.60     | -          |
| c)    | 150 mm nominal bore  | Each   | 2    | 6,816.05  |          | 13,632.10    | -          |
| d)    | 200 mm nominal bore  | Each   | 1    | 7,443.40  |          | 7,443.40     | -          |
|       |  |        |      |           |          | -            | -          |
| 7.13  | Providing and Fixing <b>CI dirt box strainer</b> for bulk type water meter with nuts, bolts, rubber insertions etc. complete conforming to IS : 2373   |        |      |           |          | -            | -          |
| a)    | 80 mm nominal bore   | Each   | 1    | 3,633.50  |          | 3,633.50     | -          |
| b)    | 100 mm nominal bore  | Each   | 1    | 5,864.10  |          | 5,864.10     | -          |
| c)    | 150 mm nominal bore  | Each   | 2    | 7,443.40  |          | 14,886.80    | -          |
| d)    | 200 mm nominal bore  | Each   | 1    | 10,430.75 |          | 10,430.75    | -          |
|       |  |        |      |           |          | -            | -          |
| 7.14  | Providing and laying D.I. specials of class K-12 suitable for push-on jointing as per IS : 9523 :  |        |      |           |          | -            | -          |
| a)    | Up to 600 mm dia.  | Qnt.   | 110  | 15,394.40 |          | 16,93,384.00 | -          |
|       |  |        |      |           |          | -            | -          |
| 7.15  | Providing push-on-joints to Centrifugally (Spun) <b>Cast Iron Pipes</b> or Ductile Iron Pipes including testing of joints and the cost of rubber gasket :  |        |      |           |          | -            | -          |
| a)    | 100 mm dia pipe  | joints | 83   | 65.10     |          | 5,403.30     | -          |
| b)    | 150 mm dia pipe  | joints | 2963 | 102.35    |          | 3,03,263.05  | -          |

| S. No | Item Description   | Unit   | Qty  | DSR Rate | NSR Rate  | DSR Amount   | NSR Amount   |
|-------|--|--------|------|----------|-----------|--------------|--------------|
| 1     | 2  | 3      | 4    | 5        | 6         | 7            | 8            |
| c)    | 200 mm dia pipe  | joints | 1809 | 154.30   |           | 2,79,128.70  | -            |
| d)    | 250 mm dia pipe  | joints | 10   | 187.65   |           | 1,876.50     | -            |
| 7.16  | Providing and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329 :  |        |      |          |           | -            | -            |
| a)    | 100 mm dia Ductile Iron Class K-7 pipes  | Metre  | 125  | 926.30   |           | 1,15,787.50  | -            |
| b)    | 150 mm dia Ductile Iron Class K-7 pipes  | Metre  | 4445 | 1,340.10 |           | 59,56,744.50 | -            |
| c)    | 200 mm dia Ductile Iron Class K-7 pipes  | Metre  | 2714 | 1,853.45 |           | 50,30,263.30 | -            |
| d)    | 250 mm dia Ductile Iron Class K-7 pipes  | Metre  | 30   | 2,509.35 |           | 75,280.50    | -            |
| 7.17  | <b>Disinfecting</b> CI water mains by flushing with water containing bleaching powder @ 0.5 gms per litre of water and cleaning the same with fresh water, operation to be repeated three times including getting the sample of water from the disinfected main tested in the municipal laboratory |        |      |          |           | -            | -            |
| a)    | 100 mm dia CI pipe   | Metre  | 125  | 1,029.71 |           | 1,28,713.75  | -            |
| b)    | 150 mm dia CI pipe   | Metre  | 4445 | 1,547.80 |           | 68,79,971.00 | -            |
| c)    | 200 mm dia CI pipe   | Metre  | 2714 | 2,070.15 |           | 56,18,387.10 | -            |
| 7.18  | Supply installation, testing & commissioning of cast iron <b>(CI) Butterfly Valves</b> of PN 16 rating   |        |      |          |           | -            | -            |
| a)    | 65 mm nominal bore   | Each   | 10   |          | 8,218.00  | -            | 82,180.00    |
| b)    | 80 mm nominal bore   | Each   | 20   |          | 8,848.00  | -            | 1,76,960.00  |
| c)    | 100 mm nominal bore  | Each   | 20   |          | 10,073.00 | -            | 2,01,460.00  |
| 7.19  | Providing and fixing <b>Ball valve (SS)</b> as per specifications of PN 10 rating.   |        |      |          |           | -            | -            |
| a)    | 25 mm  | Each   | 10   |          | 2,399.00  | -            | 23,990.00    |
| b)    | 32 mm  | Each   | 10   |          | 3,904.00  | -            | 39,040.00    |
| c)    | 40 mm  | Each   | 10   |          | 4,029.00  | -            | 40,290.00    |
| d)    | 50 mm  | Each   | 10   |          | 6,111.00  | -            | 61,110.00    |
| 7.20  | Providing and fixing gun metal <b>foot valve</b> with stainer of approved quality/model complete in all respect  |        |      |          |           | -            | -            |
| a)    | 50 mm dia  | Each   | 5    |          | 4,130.00  | -            | 20,650.00    |
| b)    | 80 mm dia  | Each   | 5    |          | 9,569.00  | -            | 47,845.00    |
| c)    | 100 mm dia   | Each   | 5    |          | 13,975.00 | -            | 69,875.00    |
| d)    | 150 mm dia   | Each   | 6    |          | 38,178.00 | -            | 2,29,068.00  |
| 7.21  | Supply, installation, testing and commissioning of <b>heavy duty Pop-up type irrigation sprinkler</b> with working pressure range of 2-6 Bar   | Each   | 150  |          | 12,222.00 | -            | 18,33,300.00 |
| 7.22  | Providing and fixing of C.I. <b>'Y' type strainer</b> flanged with SS 304 perforated screen including nuts, bolts and rubber insertions etc  |        |      |          |           | -            | -            |
| a)    | 80 mm dia  | Each   | 5    |          | 4,010.00  | -            | 20,050.00    |
| b)    | 100 mm dia   | Each   | 5    |          | 5,431.00  | -            | 27,155.00    |
| c)    | 150 mm dia   | Each   | 5    |          | 8,755.00  | -            | 43,775.00    |
| 7.23  | Supplying and installing Bourden type pressure gauges range 0 to 20 bar 10mm brass gauge cock brass pipe snubber etc complete.   | Each   | 20   |          | 1,959.00  | -            | 39,180.00    |

| S. No | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate  | DSR Amount | NSR Amount   |
|-------|---|-------|------|----------|-----------|------------|--------------|
| 1     | 2   | 3     | 4    | 5        | 6         | 7          | 8            |
|       |   |       |      |          |           | -          | -            |
| 7.24  | Providing and fixing <b>puddle flanged</b> including 40 cm long GI pipe piece welded/threaded with MS plates 450x450x6 mm thick with both end screwed/flanged. (For OHT)  |       |      |          |           | -          | -            |
| a)    | 25 mm dia   | Each  | 36   |          | 1,175.00  | -          | 42,300.00    |
| b)    | 32 mm dia   | Each  | 15   |          | 1,199.00  | -          | 17,985.00    |
| c)    | 40 mm dia   | Each  | 8    |          | 1,297.00  | -          | 10,376.00    |
| d)    | 50 mm dia   | Each  | 79   |          | 1,398.00  | -          | 1,10,442.00  |
| e)    | 65 mm dia   | Each  | 11   |          | 1,503.00  | -          | 16,533.00    |
| f)    | For 80 mm dia pipe  | Each  | 19   |          | 1,801.00  | -          | 34,219.00    |
| g)    | For 100 mm dia pipe   | Each  | 27   |          | 1,980.00  | -          | 53,460.00    |
| h)    | For 150 mm dia pipe   | Each  | 19   |          | 2,059.00  | -          | 39,121.00    |
|       |   |       |      |          |           | -          | -            |
| 7.25  | Providing and fixing <b>double seal type D.I. Manhole cover</b> of 560 mm clear internal diameter of over all heavy duty with locking arrangement complete in all respects.   | Each  | 60   |          | 12,168.00 | -          | 7,30,080.00  |
|       |   |       |      |          |           | -          | -            |
| 7.26  | Providing and fixing 3 layer PP-R (poly propelyene Random Copolymer) pipes, U V Stabilizer & anti-microbial fusion welding, having thermal stability for hot & cold water supply, including all PP-R plain & brass threaded polypropelyne random fittings including trenching, refilling & testing of joints complete as per direction of engineer in charge.   |       |      |          |           | -          | -            |
| a)    | 25 mm dia (PN10/SDR-11)   | Meter | 125  |          | 82.00     | -          | 10,250.00    |
| b)    | 40 mm dia (PN10/SDR-11)   | Meter | 125  |          | 185.00    | -          | 23,125.00    |
| c)    | 50 mm dia (PN10/SDR-11)   | Meter | 75   |          | 278.00    | -          | 20,850.00    |
| d)    | 65 mm dia (PN10/SDR-11)   | Meter | 350  |          | 446.00    | -          | 1,56,100.00  |
| e)    | 80 mm dia (PN10/SDR-11)   | Meter | 500  |          | 889.00    | -          | 4,44,500.00  |
| f)    | 100 mm dia (PN10/SDR-11)  | Meter | 2900 |          | 1,308.00  | -          | 37,93,200.00 |
| g)    | 150 mm dia (PN10/SDR-11)  | Meter | 1100 |          | 2,736.00  | -          | 30,09,600.00 |
|       |   |       |      |          |           | -          | -            |
| 7.27  | Providing and fixing motorized butterfly valve/rotary actuator (CI body, SS316 disc, EPDM boot seat, SS416 shaft, RPTEF bushing @PN16 rating) for filling of water tank complete with electrical water level control panel, including by-pass connection for the same dia with manually operated butterfly valve and all piping and accessories complete in all respects -Valve <b>at Domestic and Flushing OHT Filling</b> |       |      |          |           | -          | -            |
|       |   |       |      |          |           | -          | -            |
| a)    | 40 mm   | Each  | 5    |          | 4,376.00  | -          | 21,880.00    |
| b)    | 50 mm   | Each  | 5    |          | 13,878.00 | -          | 69,390.00    |
| c)    | 65 mm dia   | Each  | 5    |          | 14,495.00 | -          | 72,475.00    |
| d)    | 80 mm dia   | Each  | 5    |          | 25,800.00 | -          | 1,29,000.00  |
| e)    | 100 mm dia  | Each  | 1    |          | 27,768.00 | -          | 27,768.00    |
|       |   |       |      |          |           | -          | -            |
| 7.28  | Supply, installation, Testing & Commissioning of PN10 rated Solenoid valves including High / Low switches, and all necessary electric wiring, cabling , control panel including bypass arrange valve  |       |      |          |           |            |              |



| S. No | Item Description  | Unit  | Qty | DSR Rate | NSR Rate  | DSR Amount            | NSR Amount            |
|-------|---|-------|-----|----------|-----------|-----------------------|-----------------------|
| 1     | 2   | 3     | 4   | 5        | 6         | 7                     | 8                     |
| a)    | 40 mm   | Each  | 15  |          | 12,040.00 | -                     | 1,80,600.00           |
| b)    | 50 mm   | Each  | 15  |          | 12,888.00 | -                     | 1,93,320.00           |
|       |   |       |     |          |           | -                     | -                     |
|       | <b>SUB TOTAL(External Water Supply)</b>   |       |     |          |           | <b>2,85,10,477.50</b> | <b>1,44,66,278.00</b> |
| 8.00  | <b>BOREWELL</b>   |       |     |          |           |                       |                       |
| 8.01  | Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :Providing and laying cement concrete 1:2:4 mix (for sanitary sealing of well at top.)   |       |     |          |           |                       |                       |
| a)    | "1:2:4 (1 cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 20 mm nominal)   | Cum   | 12  | 5,481.95 |           | 65,783.40             | -                     |
|       |   |       |     |          |           | -                     | -                     |
| 8.02  | Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc   |       |     |          |           | -                     | -                     |
| a)    | 65 mm dia nominal bore  | Metre | 480 | 451.70   |           | 2,16,816.00           | -                     |
| b)    | 80 mm dia nominal bore  | Metre | 600 | 576.30   |           | 3,45,780.00           | -                     |
|       |   |       |     |          |           | -                     | -                     |
| 8.03  | Providing and fixing <b>gun metal gate valve</b> with C.I. wheel of approved quality (screwed end)  |       |     |          |           | -                     | -                     |
| a)    | 80 mm dia(horizontal)   | Each  | 12  | 1,919.50 |           | 23,034.00             | -                     |
|       |   |       |     |          |           | -                     | -                     |
| 8.04  | Providing and fixing gunmetal non return valve of approved make tested to a pressure of 21kg/sqcm.  |       |     |          |           | -                     | -                     |
| a)    | 80 mm dia(horizontal)   | Each  | 6   | 2,503.10 |           | 15,018.60             | -                     |
|       |   |       |     |          |           | -                     | -                     |
| 8.05  | Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-in-charge, upto 90 metre depth below ground level including carry out hydrological survey report before boring & getting the approval based on Hydrogeological survey before start of the work.Also getting approval from local authority if any required |       |     |          |           | -                     | -                     |
|       | <b>All types of soil</b>  |       |     |          |           | -                     | -                     |
| a)    | 400mm   | Metre | 480 | 518.95   |           | 2,49,096.00           | -                     |
| a.i)  | <b>Rocky strata including Boulders</b>  |       |     |          |           | -                     | -                     |
| b)    | 400 mm dia  | Metre | 240 | 1,034.50 |           | 2,48,280.00           | -                     |
|       |   |       |     |          |           | -                     | -                     |
| 8.06  | Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer -in-charge, beyond 90 metre & upto 150 metre depth below ground level.  |       |     |          |           | -                     | -                     |
| a)    | All types of soil   |       |     |          |           | -                     | -                     |
| a.i)  | 400 mm dia  | Metre | 120 | 648.70   |           | 77,844.00             | -                     |
| b)    | Rocky strata including Boulders   |       |     |          |           | -                     | -                     |

| S. No | Item Description   | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount  | NSR Amount |
|-------|--|-------|-----|----------|----------|-------------|------------|
| 1     | 2  | 3     | 4   | 5        | 6        | 7           | 8          |
| b.i)  | 400 mm dia   | Metre | 60  | 1,218.55 |          | 73,113.00   | -          |
|       |  |       |     |          |          | -           | -          |
| 8.07  | Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.  | Cum   | 30  | 1,175.60 |          | 35,268.00   | -          |
| 8.08  | Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 mild steel screwed and socketed/ plain ended casing pipes of required dia, conforming to IS: 4270, of reputed & approved make, including painted with outside surface with two coats of anticorrosive paint of approved brand and manufacture, including required hire & labour charges, fittings & accessories, all complete, for all depths, as per direction of Engineer-in-charge.   |       |     |          |          | -           | -          |
| a)    | 200 mm nominal size dia having minimum wall thickness 5.00 mm  | Metre | 480 | 1,525.90 |          | 7,32,432.00 | -          |
| 8.09  | Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 plain slotted (having slot of size 1.6/3.2 mm) mild steel threaded and socketed/ plain bevel ended pipe (type A) of required dia, conforming to IS: 8110, of reputed and approved make, having wall thickness not less than 5.40 mm, including painted with outside surface with two coats of anticorrosive bitumastic paint of approved brand and manufacture, including hire & labour charges, fittings & accessories, all complete, for all depths, as per direction of Engineer-in-charge  |       |     |          |          | -           | -          |
| a)    | 200 mm nominal size dia  | Metre | 360 | 1,607.50 |          | 5,78,700.00 | -          |
|       |  |       |     |          |          | -           | -          |
| 8.10  | Development of tube well in accordance with IS : 2800 (part I) and IS: 11189, to establish maximum rate of usable water yield without sand content (beyond permissible limit), with required capacity air compressor, running the compressor for required time till well is fully developed, measuring yield of well by "V" notch method or any other approved method, measuring static level & draw down etc. by step draw down method, collecting water samples & getting tested in approved laboratory, i/c disinfection of tubewell, all complete, including hire & labour charges of air compressor, tools & accessories etc., all as per requirement and direction of Engineer-in-charge.. | Hour  | 300 | 542.20   |          | 1,62,660.00 | -          |
|       |  |       |     |          |          | -           | -          |
| 8.11  | Providing and fixing suitable size threaded mild steel cap or spot welded plate to the top of bore well housing/ casing pipe, removable as per requirement, all complete for borewell of:  |       |     |          |          | -           | -          |
| a)    | 200 mm dia   | Each  | 6   | 231.75   |          | 1,390.50    | -          |
|       |  |       |     |          |          | -           | -          |
| 8.12  | Providing and fixing M.S. clamp of required dia to the top of casing/ housing pipe of tubewell as per IS: 2800 (part I), including necessary bolts & nuts of required size complete.   |       |     |          |          | -           | -          |
| a)    | 200 mm clamp   | Each  | 6   | 1,154.45 |          | 6,926.70    | -          |
|       |  |       |     |          |          | -           | -          |

| S. No | Item Description  | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount          | NSR Amount          |
|-------|---|-------|-----|----------|----------|---------------------|---------------------|
| 1     | 2   | 3     | 4   | 5        | 6        | 7                   | 8                   |
| 8.13  | Providing and fixing Bail plug/ Bottom plug of required dia to the bottom of pipe assembly of tubewell as per IS:2800 (part I).   |       |     |          |          | -                   | -                   |
| a)    | 150 MM DIA  | Each  | 6   | 253.95   |          | 1,523.70            | -                   |
|       |   |       |     |          |          | -                   | -                   |
| 8.14  | <b>Submersible pumps</b>  |       |     |          |          | -                   | -                   |
|       | Providing and installing submersible pump and electrical panel suitable for 200 mm dia casing of bore with SS impeller, high tensile SS shaft, copper wound squirrel cage wet type induction motor 2880 rpm, 415 V, 50 Hz, 3 phase A.C. supply, conforming to ISS: 8034-1976, capacity 300-500 LPM at 80-120 m head along with a directly coupled submersible type squirrel cage electric induction 10 H.P(minimum). motor suitable for operation on 400 V, 3 phase, 50 c.p.s. A.C. supply, water lubricated bearings and provided with pivoted segment type thrust bearings to withstand non-vertical lead with minimum wear and tear and duly fitted with device to take up the expansion of water with heating of motor, including supply, testing and commissioning of electrical panel from the same manufacturer, complete with all accessories in all respects. The contractor to obtain approval for model and make of pump set & suitable Electrical panel after having yield report of fully developed tube well and submit actual bore strata chart. |       |     |          |          | -                   | -                   |
|       | including supplying laying and fixing water proof PVC insulated flat submersible cable 3x10 sqmm with end termination with its accessories. complete in all respect as required. 1 No. 3 Phase, fully automatic star-delta starter, type - II of 15 HP with thermal overload relay, contactor, Timer, Push Buttons and Auto-manual selector switch etc complete as required.  | Set   | 6   |          |          | 2,75,307.00         | -                   |
| 8.15  | Carrying out Electrical logging of Borewell before lowering of pipe for analyzing of water quality including Electrical logging report, calculation etc. including carry out hydrological survey report before boring & getting the approval based on Hydrogeological survey before start of the work. Also getting approval from local authority if any required   | Job   | 6   |          |          | 28,962.00           | -                   |
|       |   |       |     |          |          | -                   | -                   |
|       | <b>SUBTOTAL (BOREWELL)</b>  |       |     |          |          | <b>28,33,665.90</b> | <b>18,25,614.00</b> |
| 9.00  | <b>RAIN WATER HARVESTING(12 Nos.)</b>   |       |     |          |          |                     | -                   |
| 9.01  | Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, repairing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-in-charge, upto 90 metre depth below ground level   |       |     |          |          |                     | -                   |
| a)    | <b>All types of soil</b>  |       |     |          |          |                     | -                   |
| a.i)  | 400mm   | Metre | 288 | 518.95   |          | 1,49,457.60         | -                   |
| b)    | <b>Rocky strata including Boulders</b>  |       |     |          |          | -                   | -                   |
| b.i)  | 400 mm dia  | Metre | 144 | 1,034.50 |          | 1,48,968.00         | -                   |
|       |   |       |     |          |          | -                   | -                   |

| S. No | Item Description   | Unit  | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|-------|-----|----------|----------|------------|------------|
| 1     | 2  | 3     | 4   | 5        | 6        | 7          | 8          |
| 9.02  | Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS: 12818, including required hire and labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer -in-charge.  |       |     |          |          | -          | -          |
| a)    | 150 mm dia   | Metre | 144 | 572.30   |          | 82,411.20  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.03  | Supplying, assembling, lowering and fixing in vertical position in bore well unplasticized PVC medium well screen (RMS) pipes with ribs, conforming to IS: 12818, including hire & labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer-in-charge.   |       |     |          |          | -          | -          |
| a)    | 150 mm nominal size dia  | Metre | 48  | 529.35   |          | 25,408.80  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.04  | Supplying, filling, spreading & leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge  | Cum   | 48  | 921.90   |          | 44,251.20  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.05  | Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.   | Cum   | 48  | 1,038.05 |          | 49,826.40  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.06  | Supplying, filling, spreading & leveling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -in-charge.   | Cum   | 48  | 1,038.05 |          | 49,826.40  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.07  | Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge   | Cum   | 29  | 1,175.60 |          | 34,092.40  | -          |
|       |  |       |     |          |          | -          | -          |
| 9.08  | Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000 x 450x50 mm, reinforced with 8 mm dia four nos longitudinal & 9 nos cross sectional T.M.T. hoop bars, including providing 50 mm dia perforations @ 100 to 125 mm c/c, including providing edge binding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineer-in-charge | Each  | 12  | 959.35   |          | 11,512.20  | -          |
|       |  |       |     |          |          | -          | -          |

| S. No        | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate  | DSR Amount         | NSR Amount          |
|--------------|---|-------|------|----------|-----------|--------------------|---------------------|
| 1            | 2   | 3     | 4    | 5        | 6         | 7                  | 8                   |
| 9.09         | Constructing settling tank with SS bar screen of 10 mm opening size, of sizes 4500x2500 with suitable depth up to 2.0 m in 1: 4 Cement Mortar (one cement : 4 coarse sand) height as per site requirement, in brick masonry 350mm thick walls upto water level and 230mm thick walls above water level & upto ground level, including all excavation, 20 cm thick bed concrete in 1:4:8 (one cement 4 fine sand 8 stone aggregate 40 mm), cement plaster 1:3 (one cement :3 coarse sand) with a floating coat of neat cement as inside finish , top slab in RCC 1:2:4, including centering, shuttering and steel work, also providing and fixing D.I. manhole cover & frame of size 605mm x 450mm of weight not less than 38 kg (frame + cover) and cost of 100mm dia C.I. vent pipe with C.I. Ventilating Cowl and suitable wire mesh provision for inlet, 115mm baffle walls extending 2/3 the width spaced@500mm c/c including finishing with 1:3 cement plaster 15mm thick with floating coat of neat cement slurry , all complete in every respect as pechart. | Each  | 12   |          | 96,339.00 | -                  | 11,56,068.00        |
|              |   |       |      |          |           | -                  | -                   |
|              |   |       |      |          |           | -                  | -                   |
|              | <b>SUBTOTAL (RAIN WATER HARVESTING)</b>   |       | -    |          |           | <b>5,95,754.20</b> | <b>11,56,068.00</b> |
|              |   |       |      |          |           |                    | -                   |
| <b>10.00</b> | <b>EXTERNAL SEWERAGE AND DRAINAGE (Except Around Building )</b>   |       |      |          |           |                    | -                   |
| 10.01        | Providing and <b>laying cement concrete</b> 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design:  |       |      |          |           |                    | -                   |
| a)           | 150 mm diameter S.W. pipe/RCC NP2   | Metre | 1000 | 761.85   |           | 7,61,850.00        | -                   |
| b)           | 250 mm diameter S.W. pipe/RCC NP2   | Metre | 250  | 1,027.00 |           | 2,56,750.00        | -                   |
|              |   |       |      |          |           | -                  | -                   |
| 10.02        | Providing and laying cement concrete 1:5:10 (1 cement:5 coarse sand:10 graded stone aggregate 40 mm nominal size) up to haunches of S.W. pipes including bed concrete as per standard design:   |       |      |          |           |                    | -                   |
|              |   |       |      |          |           | -                  | -                   |
| a)           | 250 mm diameter   | Metre | 1300 | 656.60   |           | 8,53,580.00        | -                   |
| b)           | 300 mm diameter   | Metre | 2780 | 757.60   |           | 21,06,128.00       | -                   |
| c)           | 450 mm diameter   | Metre | 2950 |          | 1,485.00  | -                  | 43,80,750.00        |
| d)           | 600 mm diameter   | Metre | 50   |          | 1,766.00  |                    | 88,300.00           |
|              |   |       |      |          |           | -                  | -                   |
| 10.03        | Providing and laying <b>non-pressure NP2 class (light duty) R.C.C. pipes</b> with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement:2 fine sand) including testing of joints etc. complete   |       |      |          |           |                    | -                   |
| a)           | 150 mm dia R.C.C. pipe  | Metre | 1000 | 356.70   |           | 3,56,700.00        | -                   |
| b)           | 250 mm dia R.C.C. pipe  | Metre | 1600 | 482.05   |           | 7,71,280.00        | -                   |
| c)           | 300 mm dia R.C.C. pipe  | Metre | 2780 | 518.55   |           | 14,41,569.00       | -                   |
| d)           | 450 mm dia R.C.C. pipe  | Metre | 2900 | 720.95   |           | 20,90,755.00       | -                   |
|              |   |       |      |          |           | -                  | -                   |

| S. No | Item Description  | Unit    | Qty  | DSR Rate  | NSR Rate  | DSR Amount   | NSR Amount   |
|-------|---|---------|------|-----------|-----------|--------------|--------------|
| 1     | 2   | 3       | 4    | 5         | 6         | 7            | 8            |
| 10.04 | Providing and laying Non Pressure NP-3 class (Medium duty) R.C.C.pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. Complete   |         |      |           |           | -            | -            |
| a)    | 450 mm dia R.C.C. pipe  | Metre   | 400  | 1,936.00  |           | 7,74,400.00  | -            |
| b)    | 600 mm dia R.C.C. pipe  | Metre   | 1100 | 2,517.85  |           | 27,69,635.00 | -            |
| c)    | 700 mm dia R.C.C. pipe  | Metre   | 50   |           | 2,742.00  | -            | 1,37,100.00  |
| d)    | 800 mm dia R.C.C. pipe  | Metre   | 285  |           | 3,443.00  | -            | 9,81,255.00  |
| e)    | 900 mm dia R.C.C. pipe  | Metre   | 50   | 3,664.45  |           | 1,83,222.50  | -            |
| f)    | 1000 mm dia R.C.C. pipe   | Metre   | 340  | 4,905.35  |           | 16,67,819.00 | -            |
| g)    | 1200 mm dia R.C.C. pipe   | Metre   | 110  | 6,457.85  |           | 7,10,363.50  | -            |
| h)    | 1400 mm dia R.C.C. pipe   | Metre   | 150  |           | 9,250.00  | -            | 13,87,500.00 |
| i)    | 1600 mm dia R.C.C. pipe   | Metre   | 25   |           | 15,605.00 | -            | 3,90,125.00  |
|       |   |         |      |           |           | -            | -            |
| 10.05 | Providing and laying D.I. specials of class k-12 suitable for push-on jointing as per IS:9523. Upto 600mm   | Quintal | 15   | 15,394.40 |           | 2,30,916.00  | -            |
|       |   |         |      |           |           | -            | -            |
| 10.06 | Providing and laying S&S Centrifugally Cast (Spun) / Ductile iron pipes confirming to IS : 8329 :   |         |      |           |           | -            | -            |
|       | External Work (Sewer transfer to Res.)  |         |      |           |           | -            | -            |
| a)    | 150 mm dia Ductile iron class K-9 Pipes   | Meter   | 1000 | 1,438.35  |           | 14,38,350.00 | -            |
|       |   |         |      |           |           | -            | -            |
| 10.07 | Providing push on joints to Centrifugally (spun) cast Iron pipes Ductile iron pipes including testing of joints and cost of rubber gasket   |         |      |           |           | -            | -            |
| a)    | 150 mm dia  | Each    | 667  | 102.35    |           | 68,267.45    | -            |
|       |   |         |      |           |           | -            | -            |
| 10.08 | Constructing brick masonry <b>circular type manhole</b> 0.91m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand), in side cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement: 3 coarse sand: 6 graded stone aggregate 40mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement all complete as per standard design: |         |      |           |           | -            | -            |
| a)    | <b>0.91 m deep</b> with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg., fixed in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) including centering shuttering all complete. (Excavation, foot rests and 12mm thick cement plaster at the external surface shall be paid for separately) :   |         |      |           |           | -            | -            |
| a i)  | With F.P.S. bricks class designation 75   | Each    | 31   | 8,683.75  |           | 2,69,196.25  | -            |
|       |   |         |      |           |           | -            | -            |
| 10.09 | Extra depth for circular type manhole 0.91m dia (at bottom) with beyond 0.91m to 1.67 m   |         |      |           |           | -            | -            |
| a)    | With F.P.S. bricks class designation 75   | Metre   | 10   | 4,911.80  |           | 49,118.00    | -            |
|       |   |         |      |           |           | -            | -            |

| S. No | Item Description   | Unit  | Qty | DSR Rate  | NSR Rate | DSR Amount   | NSR Amount |
|-------|--|-------|-----|-----------|----------|--------------|------------|
| 1     | 2  | 3     | 4   | 5         | 6        | 7            | 8          |
| 10.10 | Constructing brick masonry <b>circular manhole 1.22 m</b> internal dia at bottom and 0.56 m dia at top in cement mortar 1:4 ( 1 cement: 4 coarse sand) inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement foundation concrete 1:3:6 mix (1 cement :3 coarse sand : 6 graded stone aggregate 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominalsize) fineished with a floating coat of neat cement complete as per standard design.      |       |     |           |          | -            | -          |
| a)    | <b>1.68 m deep</b> with SFRC cover and frame(heavy duty HD-20 grade designation) 560 mm internal diameter conforming to IS: 12592, total weight of cover and frame to be not less than 182 kg. fixed in cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominalsize) including centering shuttering all complete. (Excavation, foot rests and 12 mm tick cement plaster at the external surface shall be paid for separately)   |       |     |           |          | -            | -          |
| a.i)  | With F.P.S. bricks with class designation 75   | Each  | 100 | 16,560.80 |          | 16,56,080.00 | -          |
|       |  |       |     |           |          | -            | -          |
| 10.11 | Extra depth for circular type manhole 1.22 m internal dia (at bottom) with beyond 1.68 m to 2.29 m   |       |     |           |          | -            | -          |
| a)    | With F.P.S. bricks with class designation 75   | Metre | 15  | 6,362.65  |          | 95,439.75    | -          |
|       |  |       |     |           |          | -            | -          |
| 10.12 | Constructing brick masonry circular manhole <b>1.52 m internal dia at bottom and 0.56 m dia</b> at top in cement mortar 1:4 (1 cement :4 coarse sand) inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement foundation concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement, all complete as per standard design : |       |     |           |          | -            | -          |
| a)    | 2.3 m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560 mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182 kg. fixed in cement concrete1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately) :   |       |     |           |          | -            | -          |
| a i)  | With common burnt clay F.P.S. (non modular) bricks of class designation 7.5  | Each  | 150 | 35,380.05 |          | 53,07,007.50 | -          |
|       |  |       |     |           |          | -            | -          |
| 10.13 | Extra depth for circular type manhole 1.52 m internal dia (at bottom) beyond 2.3 m   |       |     |           |          | -            | -          |
| a)    | With common burnt clay F.P.S. (non modular) bricks of class designation 7.5  | Metre | 20  | 15,028.55 |          | 3,00,571.00  | -          |
|       |  |       |     |           |          | -            | -          |

| S. No | Item Description  | Unit  | Qty  | DSR Rate | NSR Rate | DSR Amount   | NSR Amount  |
|-------|---|-------|------|----------|----------|--------------|-------------|
| 1     | 2   | 3     | 4    | 5        | 6        | 7            | 8           |
| 10.14 | Providing and fixing orange colour <b>safety foot rest</b> of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS: 1786 having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design. | Each  | 2840 | 327.90   |          | 9,31,236.00  | -           |
|       |   |       |      |          |          | -            | -           |
| 10.15 | Constructing brick masonry road gully chamber 50x45x60 cm with bricks of class designation 75 in cement mortar 1:4 (1 cement:4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design:   |       |      |          |          | -            | -           |
| a)    | With F.P.S. bricks  | Each  | 400  | 4,043.10 |          | 16,17,240.00 | -           |
|       |   |       |      |          |          | -            | -           |
| 10.16 | Constructing brick masonry road gully chamber 110x50x77.5 cm with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450 mm precast R.C.C. horizontal grating with frame and vertical grating complete as per standard design :   |       |      |          |          | -            | -           |
| a)    | With common burnt clay F.P.S. (non modular) bricks of class designation 7.5   | Each  | 100  | 7,522.15 |          | 7,52,215.00  | -           |
|       |   |       |      |          |          | -            | -           |
| 10.17 | Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000 x 450x50 mm, reinforced with 8 mm dia four nos longitudinal & 9 nos cross sectional T.M.T. hoop bars, including providing 50 mm dia perforations@ 100 to 125 mm c/c, including providing edge binding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineerin-charge  | Each  | 400  | 959.35   |          | 3,83,740.00  | -           |
|       |   |       |      |          |          | -            | -           |
| 10.18 | Constructing brick masonry <b>open surface drain</b> including with edge protected with MS plate of 3 mm thick with bricks of class designation 75 in cement mortar 1:4 (1 cement : 4 fine sand) including earth excavation, 10cm thick bed concrete 1:5:10 (1 cement: 5 fine sand :10 graded stone aggregate 40mm nominal size) and 25mm thick cement concrete 1:2:4 (1 cement:2 coarse sand:4 graded stone aggregate 12.5 mm nominal size) for filling hunches including 12mm cement plaster 1:4 (1 cement:4 coarse sand) with a floating coat of neat cement inside the drain, its top and exposed side including disposal of surplus earth complete as per standard design.   |       |      |          |          | -            | -           |
|       | 300mm drain 450 mm average depth  |       |      |          |          | -            | -           |
| a)    | With F.P.S bricks   | Metre | 400  |          | 2,187.43 | -            | 8,74,972.47 |
|       |   |       |      |          |          | -            | -           |



| S. No        | Item Description   | Unit  | Qty  | DSR Rate | NSR Rate    | DSR Amount            | NSR Amount            |
|--------------|--|-------|------|----------|-------------|-----------------------|-----------------------|
| 1            | 2  | 3     | 4    | 5        | 6           | 7                     | 8                     |
| 10.19        | Supply, installation, testing & commissioning of Stainless Steel Perforated Bar Screen having Coarse Screen of 10 mm opening size and fine screen of 3 mm opening size suitable for a peak flowrate of 30 m3/Hr along with suitable lifting arrangement  | Set   | 1    |          | 1,08,911.00 | -                     | 1,08,911.00           |
|              |  |       |      |          |             | -                     | -                     |
| 10.20        | Providing and constructing masonry de-silting chamber 2000mm x 1200mm with required depth inside with 75 class designated brick work in cement mortar 1:6 (1cement : 6 fine sand) with C.I double seal medium duty 560mm dia manhole cover (2Nos.). top slab 1:2:4 mix (1cement : 2coarse sand : 4 graded stone aggregate 20mm nominal size) with minimum 1.5% reinforcement, foundation concrete 1:5:10 (1cement : 5 fine sand:10 grade stone aggregate 20mm nominal size including baffle wall, necessary excavation, back filling and disposal of surface earth. Complete with inlet, outlet and overflow arrangement. Foot rest @400mm c/c, grating of required size with 16mm sq.bars and frame @20mm clear spacing fixed at mouth of pipe as per site conditions and direction of Engineer in charge | Each  | 1    |          | 51,935.00   | -                     | 51,935.00             |
|              |  |       |      |          |             | -                     | -                     |
| 10.21        | Providing and laying Laboratory/hospital effluent waste pipe and fitting of high density polyethelene (HDPE),CLASS -PE 80 ,pressure rating PN-6,conforming to IS :4427, electric fusion joints/flanged joints , fittings and jointing  |       |      |          |             | -                     | -                     |
|              | 200 mm dia   | Metre | 600  |          | 3,500.00    | -                     | 21,00,000.00          |
|              |  |       |      |          |             | -                     | -                     |
|              | <b>SUB TOTAL(Sewerage , Storm &amp; Drainage)</b>  |       |      |          |             | <b>2,78,43,428.95</b> | <b>1,05,00,848.47</b> |
|              |  |       |      |          |             | -                     | -                     |
| <b>11.00</b> | <b>EARTH WORK</b>  |       |      |          |             |                       | -                     |
| 11.01        | Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth,1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m , disposed earth to be levelled and neatly dressed.  |       |      |          |             |                       | -                     |
| a)           | All kinds of soil  | Cum   | 700  | 125.95   |             | 88,165.00             | -                     |
|              |  |       |      |          |             | -                     | -                     |
| 11.02        | Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:  |       |      |          |             | -                     | -                     |
| a)           | All kinds of soil  |       |      |          |             | -                     | -                     |
| a.i)         | Pipes, cables etc. exceeding 80 mm dia but not exceeding 300 mm dia  | Metre | 7000 | 225.45   |             | 15,78,150.00          | -                     |
| a.ii)        | Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm dia   | Metre | 1500 | 352.00   |             | 5,28,000.00           | -                     |
|              |  |       |      |          |             | -                     | -                     |

| S. No        | Item Description  | Unit        | Qty  | DSR Rate | NSR Rate | DSR Amount          | NSR Amount       |
|--------------|---|-------------|------|----------|----------|---------------------|------------------|
| 1            | 2   | 3           | 4    | 5        | 6        | 7                   | 8                |
| 11.03        | Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. (Rate is over corresponding basic item for depth upto 1.5 metre).   | Metre       | 2000 | 127.00   |          | 2,54,000.00         | -                |
|              |   |             |      |          |          | -                   | -                |
| 11.04        | Extra for excavating trenches for pipes, cables, etc, in all kinds of soil for depth exceeding 3 m in depth, but not exceeding 4.5 m. (Rate is over corresponding basic item for depth upto 1.5 metre.)   | Metre       | 1500 | 315.00   |          | 4,72,500.00         | -                |
|              |   |             |      |          |          | -                   | -                |
| 11.05        | Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered).   |             |      |          |          | -                   | -                |
| a)           | Depth not exceeding 1.5 m   | sqm         | 6000 | 108.55   |          | 6,51,300.00         | -                |
| b)           | Depth exceeding 1.5 m but not exceeding 3 m   | sqm         | 2750 | 115.05   |          | 3,16,387.50         | -                |
| c)           | Depth exceeding 3 m but not exceeding 4.5 m   | sqm         | 1300 | 129.80   |          | 1,68,740.00         | -                |
|              |   |             |      |          |          | -                   | -                |
| 11.06        | Extra rates for quantities of works, executed :   |             |      |          |          | -                   | -                |
| a)           | In or under water and/or liquid mud, including pumping out water as required  | metre depth | 1200 |          | 50.00    | -                   | 60,000.00        |
|              |   |             |      |          |          | -                   | -                |
| 11.07        | Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m  | Cum         | 250  | 125.75   |          | 31,437.50           | -                |
|              |   |             |      |          |          | -                   | -                |
| 11.08        | Extra for every additional lift of 1.5 m or part thereof in excavation / banking excavated or stacked materials.  |             |      |          |          | -                   | -                |
| a)           | All kinds of soil   | CUM         | 60   | 51.75    |          | 3,105.00            | -                |
|              |   |             |      |          |          | -                   | -                |
|              | <b>SUB TOTAL(EARTH WORK)</b>  |             | -    |          |          | <b>40,91,785.00</b> | <b>60,000.00</b> |
|              |   |             |      |          |          | -                   | -                |
| <b>12.00</b> | <b>WTP &amp; PUMP ROOM WORKS</b>  |             |      |          |          |                     |                  |
|              |   |             |      |          |          |                     |                  |
| 12.01        | Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use of domestic purpose comprising of filter and pumps. The plant is to be installed in pump room and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc. |             |      |          |          | -                   | -                |
|              | The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make.(Ion exchange, Pollucon technologies, Thermax, oxybee solution,geo miler).  |             |      |          |          | -                   | -                |
|              |   |             |      |          |          | -                   | -                |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
| a)    | Providing and fixing vertical in line SS raw water filter feed pumps with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer ( Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency ) |      |     |          |          | -          | -          |
|       | Raw water filter feed pumps(only for domestic use).  |      |     |          |          | -          | -          |
|       | Capacity : 750 lpm (Each)  |      |     |          |          | -          | -          |
|       | Head 35 m  |      |     |          |          | -          | -          |
|       | Power : 10 HP  |      |     |          |          | -          | -          |
|       | with 100% standby pumps(1W+1S) 2 Nos.  |      |     |          |          | -          | -          |
| b)    | Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent)   |      |     |          |          | -          | -          |
|       | 50/80 mm dia (min.) or required size and required number( 1 Set)   |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
| c)    | Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto or equivalent)  |      |     |          |          | -          | -          |
|       | 80/50 mm NB (min.) or required size and number(1 Set)  |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
| d)    | Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.  |      |     |          |          | -          | -          |
|       | 80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery)  |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
| e)    | Filtration Plant : Vertical Down flow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :   |      |     |          |          | -          | -          |
|       | a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.   |      |     |          |          | -          | -          |
|       | b) Initial charge of Filter Media.   |      |     |          |          | -          | -          |
|       | c) Complete underdrain system and raw water distributor as per manufacturer's design.  |      |     |          |          | -          | -          |
|       | d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.   |      |     |          |          | -          | -          |
|       | e) Pressure gauges (100 mm dia bourdon type pressure gauge ) / Sampling points with SS isolation cocks at inlet and outlet.  |      |     |          |          | -          | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint .   |      |     |          |          | -          | -          |
|       | g) The filter shall be complete with all gaskets / fasteners of standard quality as required.   |      |     |          |          | -          | -          |
|       | h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The filter water will be supplied to treated water tank through activated carbon filter, Softener & UV water steriliser. |      |     |          |          | -          | -          |
|       | Capacity - 750 lpm  |      |     |          |          | -          | -          |
|       | Filtration rate - 20,000 lph/sqm ( min.)  |      |     |          |          | -          | -          |
|       | Filter dia approx. 1.50 m (min.)  |      |     |          |          | -          | -          |
|       | Filter HOS Min. : 1600 mm (min.)  |      |     |          |          | -          | -          |
|       | Working pressure : 3.0 Kg/sq cm.  |      |     |          |          | -          | -          |
|       | Test pressure : 4.5 Kg/sq cm  |      |     |          |          | -          | -          |
|       | No. Of Unit - 1 Set   |      |     |          |          | -          | -          |
|       |   |      |     |          |          | -          | -          |
| f)    | Filtration Plant : Activated Carbon Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :   |      |     |          |          | -          | -          |
|       | a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.  |      |     |          |          | -          | -          |
|       | b) Initial charge of Activated Carbon   |      |     |          |          | -          | -          |
|       | c) Complete underdrain system and raw water distributor as per manufacturer's design.   |      |     |          |          | -          | -          |
|       | d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.  |      |     |          |          | -          | -          |
|       | e) Pressure gauges (100 mm dia bourdon type pressure gauge ) / Sampling points with SS isolation cocks at inlet and outlet.   |      |     |          |          | -          | -          |
|       | f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint .   |      |     |          |          | -          | -          |
|       | g) The filter shall be complete with all gaskets / fasteners of standard quality as required.   |      |     |          |          | -          | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate     | DSR Amount | NSR Amount     |
|-------|--|------|-----|----------|--------------|------------|----------------|
| 1     | 2  | 3    | 4   | 5        | 6            | 7          | 8              |
|       | h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The water shall be received from pressure sand filter and supplied to softener & through UV steriliser before being sent to treated water tank. |      |     |          |              | -          | -              |
|       | Capacity - 750 lpm   |      |     |          |              | -          | -              |
|       | Filtration rate - 20,000 lph/sqm ( min.)   |      |     |          |              | -          | -              |
|       | Filter dia approx. 1.50 m (min.)   |      |     |          |              | -          | -              |
|       | Filter HOS Min. : 1600 mm (min.)   |      |     |          |              | -          | -              |
|       | Working pressure : 3.0 Kg/sq cm.   |      |     |          |              | -          | -              |
|       | Test pressure : 4.5 Kg/sq cm   |      |     |          |              | -          | -              |
|       | No. Of Unit - 3 Set  |      |     |          |              | -          | -              |
|       |  |      |     |          |              |            |                |
| g)    | UV WATER STERILISERS(between filter &clear water tank)   |      | -   |          |              | -          | -              |
|       | High performance on line UV water sterilizers of capacity 650 lpm designed on at least 250 J/Sq. M. UV dosage, comprising of glass UV chamber in SS 316 housing, UV lamp and electrical circuit, wall mounted model / line mounted model, capacity 650 lpm, minimum lamp rating :150 watts - 1 Nos.  |      | -   |          |              | -          | -              |
|       |  |      | -   |          |              | -          | -              |
| h)    | Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 ( <b>Heavy class</b> ) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers.  |      | -   |          |              | -          | -              |
|       | 50 mm dia ( min.) ( Interconnection between units )/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)  |      | -   |          |              | -          | -              |
|       |  |      | -   |          |              | -          | -              |
| i)    | Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).   |      | -   |          |              | -          | -              |
|       | Cost For Complete WTP System as above  | Set  | 3   |          | 39,29,559.00 | -          | 1,17,88,677.00 |
|       |  |      |     |          |              |            | -              |
| 12.02 | <b>Softner For Complete HVAC Work</b>  |      |     |          |              |            | -              |
|       | Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use for domestic purpose comprising of filter and pumps. The plant is to be installed in pump room at basement level and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc.   |      |     |          |              | -          | -              |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
|       | The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, AKAR Impex, Thermax, Aquaprocess).   |      |     |          |          | -          | -          |
|       | Providing and fixing horizontal/ vertical on line single/multi-stage raw water filter feed pumps mounting on a foundation with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts, 1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts etc. with suction stainer ( Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency )   |      |     |          |          | -          | -          |
|       | <b>Water Softener feed pump</b>  |      |     |          |          | -          | -          |
|       | <b>Capacity : 1000 LPM</b>   |      |     |          |          | -          | -          |
|       | <b>Head 35 m</b>   |      |     |          |          | -          | -          |
|       | Power : 10HP (minimum)   |      |     |          |          | -          | -          |
|       | with 100% standby pumps(1W+1S)(The one set of the system will comprise the cost of 2 nos. pumps)   |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
|       | Providing and fixing GI/CPVC epoxy coated pipe & fittings and specials for suction and discharge side of pumps as required to connect Suction strainers and isolation butterfly valves on suction side and isolation valves and NRVs on discharge size , and to make a common discharge header from all pumps. Individual pump suction and discharge size minimum : 80 mm x 65 mm. The pumps shall have 100 mm NB butterfly valves and 100 mm NB flanged Y type strainers on suction side and common discharge header size : 80 mm NB including required numbers of matching flange, bolts, nuts, rubber gaskets, all complete as required / as per drawings or specifications. (complete lot) |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
|       | Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen, flanged ends iner installed outside water tanks. (Make: Leader / Zoloto / Castle or equivalent)  |      |     |          |          | -          | -          |
|       | 80/100 mm dia (4 nos.) (min.) or required size and required number   |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
|       | Providing and fixing G / M or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm <sup>2</sup> , screwed end connections complete . (Make: Leader/ Zoloto/Castle or equivalent)  |      |     |          |          | -          | -          |
|       | 80/65 mm NB (min.) or required size and number   |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |
|       | <b>Filtration Plant</b> : Vertical Downflow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :   |      |     |          |          | -          | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
|       | a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.   |      |     |          |          | -          | -          |
|       | b) Initial charge of Filter Media.   |      |     |          |          | -          | -          |
|       | c) Complete underdrain system and raw water distributor as per manufacturer's design.  |      |     |          |          | -          | -          |
|       | d) M.S. heavy class fabricated - epoxy coated / post galvanised face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.   |      |     |          |          | -          | -          |
|       | e) Pressure gauges (100 mm dia bourdon type pressure gauge ) / Sampling points with SS isolation cocks at inlet and outlet.  |      |     |          |          | -          | -          |
|       | f) All internal parts of the filtration plant shall be coated 6 mm thick natural rubber lining after thorough sand blasting. All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint .   |      |     |          |          | -          | -          |
|       | g) The filter shall be complete with all gaskets / fasteners of standard quality as required.  |      |     |          |          | -          | -          |
|       | h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, Geomiller, Thermax, Aquaprocess, LN Tech). The filter water will be supplied to Softner before collecting in treated water tank. |      |     |          |          | -          | -          |
|       | <b>Capacity - 1000LPM</b>  |      |     |          |          | -          | -          |
|       | Filtration rate - 20,000 lph/sqm ( min.)   |      |     |          |          | -          | -          |
|       | <b>Filter dia approx. 1600 mm (min.)</b>   |      |     |          |          | -          | -          |
|       | Filter HOS Min. : 1800 mm (min.)   |      |     |          |          | -          | -          |
|       | Working pressure : 3.0 Kg/sq cm.   |      |     |          |          | -          | -          |
|       | Test pressure : 4.5 Kg/sq cm   |      |     |          |          | -          | -          |
|       | Providing and fixing, testing and commissioning M.S. Vertical Upflow "Cation" Ion Exchange water Softener fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8mm thick M.S. plate on dished ends as per applicable IS standards. The vessel shall be internally lined with 6.00 mm thick rubber, tested to 60 - 80 shore hardness, 15000 RMS volts spark test for continuity. The softener shall have :   |      |     |          |          |            | -          |
|       | a) Strainer plates at top and bottom with P.P. strainers with removable nuts and check nuts fixed on the plates.   |      |     |          |          |            | -          |
|       | b) GI/CPVC heavy class fabricated internally rubber lined face piping comprising of connections with CI Diaphragm Valves of required size for inlet, outlet, and rinse drain etc.  |      |     |          |          |            | -          |
|       | c) Regeneration assembly comprising of power valve, ejector, brine suction valve, and all necessary piping incorporated into the main pipework.  |      |     |          |          |            | -          |
|       | d) Pressure gauges (100 mm dia bourdon type pressure gauge ) / Sampling points with SS isolation cocks at inlet and outlet.  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | e) All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint .  |      |     |          |          |            | -          |
|       | f) The softener shall be complete with all gaskets / fasteners of standard quality as required.   |      |     |          |          |            | -          |
|       | g) Initial charge of Ion Exchange resin.  |      |     |          |          |            | -          |
|       | h) The softener shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein.  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | i) M.S. rubber lined vertical, cylindrical self supporting open tank for salt mixing and brine saturation with air agitation arrangement comprising of G. I. heavy class air distributor laid at the bottom of tank, roots type air blower complete in all respects of suitable capacity to agitate the required quantity of brine, piping interconnection between air blower and air distributor. The brine tank to have nozzles for outlet, overflow and drain. Outside finished with high gloss enamel paint over two coats of zinc chromate primer complete including testing and commissioning. Net usable capacity of the tank excluding free board etc., should be at least 10 % more than actual capacity required. |      |     |          |          |            | -          |
|       | <b>Capacity of softening plant : 1000 LPM</b>   |      |     |          |          |            | -          |
|       | Raw Hardness : 700-1200 mg/l.   |      |     |          |          |            | -          |
|       | Regeneration period interval not less than 8 hr.  |      |     |          |          |            | -          |
|       | Quantity of soft water between two regenerations =250KL   |      |     |          |          |            | -          |
|       | <b>Approximate Dia =1600 mm, HOS 1800 mm (min.) or as required</b>  |      |     |          |          |            | -          |
|       | Type of Resin : Strongly acidic cation resin  |      |     |          |          |            | -          |
|       | Make of Resin : Ion Exchange / Rohm & Haas  |      |     |          |          |            | -          |
|       | Min. qty. of resin :2800 Ltrs.  |      |     |          |          |            | -          |
|       | Operating pressure : 3.0 kg/sqcm  |      |     |          |          |            | -          |
|       | Test pressure : 5.50 kg/sqcm (Set-1)  |      |     |          |          |            | -          |
|       | Soft water quality: Commercial zero hardness  |      |     |          |          |            | -          |
|       | Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 ( <b>Heavy class</b> ) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers.   |      |     |          |          |            | -          |
|       | 65/80 mm dia ( min.) ( Interconnection between units )/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).  |      |     |          |          |            | -          |
|       | 80 mm dia (min.) (as per required length)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |



| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate     | DSR Amount | NSR Amount     |
|-------|--|------|-----|----------|--------------|------------|----------------|
| 1     | 2  | 3    | 4   | 5        | 6            | 7          | 8              |
|       | Complete W.T.P as mentioned above including testing, training and trial run till commissioning of W.T.P.   | Set  | 3   |          | 33,35,180.00 | -          | 1,00,05,540.00 |
|       |  |      |     |          |              | -          | -              |
| 12.03 | Providing and fixing of OxilYTE (Mixed Oxidant ) Generation System , based on ECA technology, producing non toxic mixed oxidant solution 50 Ltrs/hr at 1000 ppm of Oxidant concentration with auto flushing system . The solution should be at a pH 3+-0.5 suitable for 24x7 operations should produce 1000 L per day. The system should be supplied complete with appropriate dosing pumps, valves, piping, fittings, chemical dosing tank etc. complete in all respect( shop drawing model and technical data etc. are to be submitted for approval before purchase ). The system shall install to dose the oxylite solution in the treated water transfer pumping main and synchronised with the operation of transfer pump | Set  | 3   |          | 11,89,351.00 | -          | 35,68,053.00   |
|       |  |      |     |          |              | -          | -              |
| 12.04 | STRUCTURAL STEEL WORK  |      |     |          |              | -          | -              |
| a)    | Supply, fabrication, erection, painting of pipe supports of structural steel, for piping work in the production areas and anchoring them. 2 coats of zinc chromate primer and one coat of finishing paint  | Kgs. | 300 |          | 84.00        | -          | 25,200.00      |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate  | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|-----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6         | 7          | 8          |
|       |   |      |     |          |           | -          | -          |
| 12.05 | Supplying, assembly, erection, testing and commissioning of level controllers based on level switches and necessary auxiliary circuits included in the electric panel ,including all accessories required for the performance of the system to the satisfaction of the engineer in charge complete including providing and fixing wiring from control panel to the level switches of required size, all interconnections as required . Note : The required transformers / associated equipment shall be designed keeping in view the actual distance of various tanks from the control panel, particularly the distance of Terrace water tank from panel. The most suitable route of sensor cable travel between the panel and the tank shall have to be worked out by the contractor according to site conditions and in consultation with engineer in charge. All cabling / switch installation should be done in an easy to maintain manner. |      |     |          |           | -          | -          |
|       | One way one tank level controller as under.   |      |     |          |           | -          | -          |
| a)    | To switch on the tube well pump when the level of water in the UG raw water tank is low and to cut off the pump when the level in the underground raw water tank is high. ( Approx. control cable requirement -200 meters. )  | Set  | 6   |          | 13,469.00 | -          | 80,814.00  |
|       | Two way - Two tank level controller as under.   |      |     |          |           | -          | -          |
| b)    | For Filter Feed Pumps for Domestic Water.( Operating between the raw water tank and the under ground treated water tank near the plant room. ( Approx. control cable requirement - 100 meters. )  | Set  | 6   |          | 13,469.00 | -          | 80,814.00  |
|       | For Treated water supply Pumps( Operating between the under ground treated water tank near the plant room and the Terrace treated water tank . ( Approx. control cable requirement - 150 meters. )  | Set  | 6   |          | 13,469.00 | -          | 80,814.00  |
|       |   |      |     |          |           | -          | -          |
| 12.06 | Providing and fixing gun metal foot valve with stainer of approved quality/model complete in all respect  |      |     |          |           | -          | -          |
| a)    | 80 mm dia   | Each | 4   |          | 9,398.00  | -          | 37,592.00  |
| b)    | 100 mm dia  | Each | 4   |          | 13,752.00 | -          | 55,008.00  |
|       |   |      |     |          |           | -          | -          |
| 12.07 | Providing, fixing and testing of packaged type skid mounted hydropneumatic with VFD on every pump, system type comprising of :-   |      |     |          |           | -          | -          |
|       | (i) Design, engineer, procure, supply, test and commission a pre-engineered, factory fabricated, assembled & tested, fully integrated, highly efficient pump, IE2 motors, skid mounted, complete ready-to-connect packaged pressure booster station, complete with vertical multi stage centrifugal pumps connected in parallel, high efficiency IE2 motors, intelligent multi-pump controller, the controller shall be mounted in a control cabinet with an IP 55 enclosure of suitable rating; SS304 suction and delivery manifolds; isolation ball valves on suction and discharge of each pump; non return valve on discharge side of each pump; hot dip galvanised common base frame; and diaphragm pressure vessel PN10   |      |     |          |           | -          | -          |
|       |   |      |     |          |           | -          | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
|       | (ii) The pump shall have cast iron head and base, SS304 impeller, SS304 Casing, SS316 Shaft  |      |     |          |          | -          | -          |
|       | (iii) The motor shall be of efficiency class IE2, insulation class F, enclosure class IP55, capable of operation at 3 phase, 50 Hz, 380-415 V, with built-in thermistor PTC  |      |     |          |          | -          | -          |
|       | (iv) Pressure vessel of non corrosive SS304 Food Grade. Air cell burst pressure of minimum of 5 times the vessel operating pressure and cycle tested for 2,50,000 cycles with minimum capacity of 100 Litres   |      |     |          |          | -          | -          |
|       | (v) Control Panel to be of enclosure class IP41, with programmable logic controller (PLC) for cyclic operation of pumps. Pump working sequence should change after every operation. Contractor overload relays and MCBs should conform to IEC 898 – 1995/ specifications. Blinking indications for pumps start, trip, low level trip, health supply should be provided in the panel along with the ammeter & voltmeter. Control panel should also consist of cooling fan.  |      |     |          |          | -          | -          |
|       | (vi) Pressure tank capacity: (as per manufacturer recommendation) Note: Back up calculation need to be provided for the same. A pre-charged Carbon Steel body diaphragm tank shall be fitted to the discharge pipe with a compatible Butyl-rubber diaphragm. It shall supply water a very low flows to minimize frequent pump start and stop and water hammering. There shall be complete separation between water and air and there should be no contact between water and tank compounds to avoid corrosion. Bladders shall be suitable for sufficient elasticity to permit full expansion inside the tank to ensure better performance and longer working life. |      |     |          |          | -          | -          |
|       | (vii) Pressure switches bellow type fitted with micro switch and having maximum pressure and differential scale should confirming BS-6134 standards and IP55 protection class.   |      |     |          |          | -          | -          |
|       | (viii) Ball valves to be used should be Hot Pressed brass OT-58 with stainless steel ball and P.T.F.E seal and O-Ring. NRVs to be used should be with Springs and O-Ring arrangement.  |      |     |          |          | -          | -          |
|       | Pressure Transmitter (0-10/16/25bar, based on system design pressure)  |      |     |          |          | -          | -          |
|       | Pressurge Gauge - 0-16bar  |      |     |          |          | -          | -          |
|       | Suction & Delivery Manifolds - SS304   |      |     |          |          | -          | -          |
|       | One non-return valve and isolating valves for each pump is provided in delivery side and one isolating valve is provided in suction side.  |      |     |          |          | -          | -          |
|       | Complete set system to be mounted on a common base frame and shall follow following duty.  |      |     |          |          | -          | -          |
|       |  |      |     |          |          | -          | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate     | DSR Amount | NSR Amount   |
|-------|--|------|-----|----------|--------------|------------|--------------|
| 1     | 2  | 3    | 4   | 5        | 6            | 7          | 8            |
| a)    | Domestic water Hydropneumatic pumps + Feeding to Cooling tower for OPD   |      |     |          |              | -          | -            |
|       | System Peak Flow : 2250 LPM  |      |     |          |              | -          | -            |
|       | Head : 80 M  |      |     |          |              | -          | -            |
|       | no. of pumps: 6 (3w+3s)  |      |     |          |              | -          | -            |
|       | flow per pump : 750 LPM  |      |     |          |              | -          | -            |
|       | Bladder Vessel : 500 lit   |      |     |          |              | -          | -            |
|       | Skid Assembly with butterfly valves to isolate each pump,NRV for each pump, suction and discharge manifold in GI.Y strainer at suction of pump set with butterfly valve.   |      |     |          |              | -          | -            |
|       | Starter VFD (IP 55 rated) for each pump with Microprocessor panel with wiring upto pumps and VFDs with Control Panel mounted on skid   | Set  | 1   |          | 24,62,501.00 | -          | 24,62,501.00 |
|       |  |      |     |          |              | -          | -            |
| 12.08 | Providing and fixing vertical in line SS centrifugal pumps with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer ( Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency ) |      |     |          |              | -          | -            |
|       |  |      |     |          |              | -          | -            |
|       | Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.  |      |     |          |              | -          | -            |
|       |  |      |     |          |              | -          | -            |
| a)    | Flushing Pump in Main UGT to connect to flushing ring line   |      |     |          |              | -          | -            |
|       | Capacity : 600 lpm (Each)  |      |     |          |              | -          | -            |
|       | Head : 70 m  |      |     |          |              | -          | -            |
|       | Power : 16.0 HP  |      |     |          |              | -          | -            |
|       | with 100% standby pumps  |      |     |          |              | -          | -            |
|       | Total Cost of flushing pump with accessories   | Each | 3   |          | 3,50,301.00  | -          | 10,50,903.00 |
|       |  |      |     |          |              | -          | -            |
| b)    | Softwater Transfer Pump  |      |     |          |              | -          | -            |
|       | Capacity : 600 lpm (Each)  |      |     |          |              | -          | -            |
|       | Head : 70 m  |      |     |          |              | -          | -            |
|       | Power : 16.0 HP  |      |     |          |              | -          | -            |
|       | with 100% standby pumps  |      |     |          |              | -          | -            |
|       | Total Cost of Soft water transfer pump with accessories  | Each | 4   |          | 3,50,301.00  | -          | 14,01,204.00 |
|       |  |      |     |          |              | -          | -            |

| S. No        | Item Description  | Unit | Qty | DSR Rate | NSR Rate  | DSR Amount | NSR Amount            |
|--------------|---|------|-----|----------|-----------|------------|-----------------------|
| 1            | 2   | 3    | 4   | 5        | 6         | 7          | 8                     |
| 12.09        | Supply, installing, testing and commissioning vertical fully floodable type <b>submersible drainage pump of non-corrosive material</b> in close coupled design single stage, suitable for handling minimum 10 mm dia solids for transferring waste water from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump, start and stop push button contactor with required overload production and single phase preventer. |      |     |          |           | -          | -                     |
|              | Material of Construction (M.O.C):<br>Corrosion Resistant in general   |      |     |          |           | -          | -                     |
|              | : Casing — Cast Iron  |      |     |          |           | -          | -                     |
|              | : Impeller — SS   |      |     |          |           | -          | -                     |
|              | : Bearings — Anti friction,<br>prelubricated ball bearings,<br>packed with grease for life.   |      |     |          |           | -          | -                     |
|              | Motor: — Dry Motor with built in over<br>load protection  |      |     |          |           | -          | -                     |
|              | Protection - IP68.  |      |     |          |           | -          | -                     |
|              | Insulation Class - F  |      |     |          |           | -          | -                     |
|              | Duty of each pump   |      |     |          |           | -          | -                     |
|              |   |      |     |          |           | -          | -                     |
| a)           | 450 LPM against 12 M head - For Pump Room Drainage  | Each | 2   |          | 99,612.00 | -          | 1,99,224.00           |
| b)           | 450 LPM against 12 M head - For Basement Drainage   | Each | 8   |          | 99,612.00 | -          | 7,96,896.00           |
|              |   |      |     |          |           | -          | -                     |
| 12.10        | Testing Underground tank for water seepage before fixing of tiles or any other finishing including pressure grouting (if required). The tank should be disinfected and cleaned before use as per instruction of Engineer-in-charge(up to 5 lac ltr tank)  | Set  | 1   |          | 30,000.00 | -          | 30,000.00             |
|              | <b>SUB TOTAL(WATER TREATMENT PLANT)</b>   |      |     |          |           | -          | <b>3,16,63,240.00</b> |
| <b>13.00</b> | <b>EFFLUENT TREATMENT PLANT(ETP) -</b>  |      |     |          |           |            | -                     |
|              |   |      |     |          |           |            | -                     |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
| 13.01 | Providing and fixing packaged type Effluent treatment plant including design/shop drawing and obtain the approval from HSCC,erection,commissioning,construction of ETP including civil,mechanical,electrical,piping work complete in all respect on turnkey basis.The system should be fully automatic with level control,compact,odor free and shall consume low power. ETP will be placed near STP site of the building of suitable size for 100 KLD required to treat the effluent of lab,effulent,kitchen and hospital by using suitable technology complete in all respect including oil and grease trap/chemical reaction with suitable chemical dosing such as Fentons reagent or any other suitable for effluent/mixer/settler/neutralisation chamber,dosing pump and agitator ,holding tank,including multigrade filter stand by motor pump,blower etc. pumps and piping,filter,sludge holding tank,filter press,testing kit,electrical panel,air blower,RCC Equilisation tank/holding tank.Treated water transfer pump and sump of suitable capacity |      |     |          |          |            | -          |
| a     | .Agency has to consider the lab waste effluent for various parameter and as per standard practice in various existing AIIMS and may be confirmed from any functional AIIMS desired no. of test reports of raw/treated lab effluent to carried by agency. The ETP work includes pumps,blower,raw and treated water tank PVC,electric Panel, electric wire inside the ETP area, 1 No. mixed oxident generation system based on ECA Technology of approved make 30 Ltrs/hr capacity. SS Agetor in SS-316 reactor Tanks(2-3 mm thick), Dosing pumps & tanks , ladder,working platform,painting,interconnecting pipe valve,foundation, support etc., complete in all respect( all pump shall be SS impler & adequate solid handling capacity, Mechanical Seal).   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| b     | DISCHARGE EFFLUENT CHARACTERSTICS AFTER PHYSICO-CHEMICAL TREATMENT   |      |     |          |          |            | -          |
|       | pH - 6.5 – 8.5   |      |     |          |          |            | -          |
|       | BOD - Less than 50 Mg/L  |      |     |          |          |            | -          |
|       | S. Solids - Less than 20 Mg/L  |      |     |          |          |            | -          |
|       | COD - Less than 150 Mg/L   |      |     |          |          |            | -          |
|       | Oil & Grease - Less than 5 Mg / L  |      |     |          |          |            | -          |
|       | E coli - absent  |      |     |          |          |            | -          |
|       | Odor - unobjectionable   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| c     | Effluent treatment plant shall include the following items: - make of material as per STP or approved by HSCC engineer In-charge   |      |     |          |          |            | -          |
|       | Screen Chamber   |      |     |          |          |            | -          |
|       | Collection Tank- RCC 50 CUM Mini.  |      |     |          |          |            | -          |
|       | <b><u>Reaction Tank- SS tank &amp; agitator of required HP having RPM 80-100 for the reaction tank having SS 316 shaft with suitable rating motor and gear box assembly including mounting arrangement and accesibility arragement.</u></b>  |      |     |          |          |            | -          |
|       | Tube Settler - MS ( Hydraulic loading 1.5 cum/sqm/hr. Tube   |      |     |          |          |            | -          |
|       | Clear Water Tank- RCC / MS   |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount   | NSR Amount          |
|-------|---|------|-----|----------|----------|--------------|---------------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7            | 8                   |
|       | Sludge Holding Tank   |      |     |          |          |              | -                   |
|       | <b>Foundation of all electro-mechanical Equipments</b>  |      |     |          |          |              | -                   |
|       | Staircases and Railing  |      |     |          |          |              | -                   |
|       | Platform required to access the various units   |      |     |          |          |              | -                   |
|       | Screen - SS (1+1)   |      |     |          |          |              | -                   |
|       | Submersible Raw effluent pump,SS Impeller, Solid Handling 20 cum/Hr. - Head 10 Metre  |      |     |          |          |              | -                   |
|       | Effluent Transfer Pump  |      |     |          |          |              | -                   |
|       | Chemical Dosing system with mixing arrangement dosing pump of capacity 0-12 LPH for Alum and 0-6 LPH for Polymer @ 4 bar, dosing tank of capacity 100 Litre x 2 Number. Make - Asia LMI for Dosing Pump and Sintex for chemical Tanks   |      |     |          |          |              | -                   |
|       | Sludge System   |      |     |          |          |              | -                   |
|       | Sludge System - Mechanism filter press comprising of CI body grade FG 20, polypropylene plate with sizes of 600 x 600 mm x 22 number plates. The filter press shall be complete with PP nozzle, Sludge trolley, filter clothes screw pump to filter press 4 M3/Hr @ 40 mtr head, double stage, flanged end, CI body, alloy steel screw and rotating parts,complete. No. required is 2 Nos. (1W + 1S)  |      |     |          |          |              | -                   |
| d     | All the unit of ETP shall be MS sheet min. 4/5 mm thickness with suitable structure support complete in all respect including min2-.3 layers approved epoxy / FRP or other approved corrosion resistant coating/protection of all parts.The ETP units shall be designed in such a way that the lab effluent doesnot effect the function of STP when treated lab effluent mixed in the domestic sewer line,treated effluent shall meet the SPCB norms and also obtain adequacy report and treated effluent test report for SPCB. Agency has to maintain and operate the ETP during defect liability period including cost of manpower,chemical etc except electricity cost.Work shall be carried out by specialised agency / authorized Vender of ETP ( Geo Miler & Co, Ion-Exchange, Oxybee, Pollucon Technologies, Thermax, ) authorized Vender will be required to produce documents in support of their authorization from the specialised agency. The work shall be carried out by trained authored staff of the company. ( excluding cost of civil work) | Lot  | 1   |          |          | 38,20,892.00 | 38,20,892.00        |
|       |   |      |     |          |          | -            | -                   |
|       | <b>Grand total ETP (Including O&amp;M)</b>  |      |     |          |          | -            | <b>38,20,892.00</b> |
|       |   |      |     |          |          |              | -                   |
| 14    | <b>SEWAGE TREATMENT PLANT</b>   |      |     |          |          |              | -                   |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
| 14.01 | Planning,Designing,Detailing,Supplying, Erection,Testing and Commissioning of Sewage treatment plant based on MBBR (Moving bed Bio Reactor)/FAB technology of average flow rate of 1200 cu.m/day (2 streams) for sewer including provision of recirculation of treated sewage/effluent for the use of horticulture/flushing/A/c purposes including design and execution of all civil,structural,electrical,mechanical, plumbing and processing, ancillary equipments and works etc required to complete the package, getting approval from state pollution control board and other statutory bodies as well as from HSCC including the cost of STP building for electrical room, treated sewage under ground storage tank etc. <b>STP shall be design in such a way that it has a provision to easy extension for phase-II load (appr. 800 KLD or more).The planning &amp; designing has to carried out for phase-I &amp; II, HOWEVER THE EXECUTION WILL BE CARRIED OUT ON LY FOR PHASE -I .i.e. 1200 KLD capacity.</b> |      |     |          |          |            | -          |
|       | All the water retaining structure shall be designed as water retaining structure as per provision of IS code and water proofing with fixed or any other approved chemical shall be carried out by approved agency with 10 year (minimum) guaranty. All the unit shall be painted by epoxy or fixed with the white glazed tiles of approved make. The civil works of entire STP will be carried out by agency as per drawings prepared by STP E&M agency. The shop drawings & design of STP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements & meeting the following requirements The work has to be carried by approved make agency / through authorised vendor/dealer of approved make under overall supervision of main approved agency as per list of approve make (Ion exchange, Pollucon technologies, Thermax, geo miler,oxybee solution).   |      |     |          |          |            | -          |
| a)    | Civil works will be measured and paid under relevant items Separately.<br>A.Raw water effluent charecteristics-<br>(A) Flow Rate 1200 cub.m/day, peak factor-3, Raw Effluent Charecteristics- BOD-200-300 mg/l, TSS -200 - 400 COD-400-650 mg/l, N-Total-45 mg/l, PO4-50 mg/l.<br>(B) Treated Effluent Charecteristics- after STP before ultrafiltration unit/softner - BOD-< 5mg/l. COD-< 50 mg/l. TSS-< 5mg/l. N-Total-<5 mg/l PO4-P<2 mg/l.<br>(C) Treated water after ultrafiltration shal be fit for domastic use in flushing etc as per norms.  |      |     |          |          |            | -          |



| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
| b)    | The shop drawings & design of STP shall be prepared by the agency . As per site condition/available space most of the unit will be placed below ground under road/green area/ as per site condition and equipment and Panel room may be above the ground level as per approved drawings .The STP shall be comprising of the following units of required size as per detail process and hydraulic design. The structure design shall be carried as per provision of IS code. The agency has to get their structure drawing checked and approved by any govt. Engineering college approved by consultant.  |      |     |          |          |            | -          |
| c)    | RCC Suitable size mechanical Bar Screen chamber with minimum free board 300 mm and minimum size 1.5 mx1.0mx0.40 m SWD and additional manual suitable size SS Bar screen is installed at suitable angle at the inlet of raw sewage sump before pumping and mechanical system to collect and lifts/transport the screening material . The unit shall be designed for peak flow , and one no. SS slotted additional manual fine screen 2 mm thick after mechanical bar screen to be fixed in chamber itself. Inlet chamber of suitable size with SS manual operated spindle riser SS 304 gate shall also be provided before Bar Screen.   |      |     |          |          |            | -          |
|       | Complete mechanical Bar Screen and SS slotted fine screen Electrical & mechanical Works , screening material collection and lifting system upto Ground formation level (excluding civil works) (Set-1)   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| d)    | RCC 2 nos., Suitable size Grit chamber with grit removal arrangement at one end of the chamber operated at a fixed interval. The grit chamber shall be suitable for surface overflow rate 959 m3 / m2 / day, The unit shall be designed for peak flow.   |      |     |          |          |            | -          |
|       | Cost of deflector (MOC- SS 304) at upstream and proportional flow weir (MOC-SS 304 ) at downstream of Grit Chamber.  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| e)    | Supply, installing, testing and commissioning vertical fully floodable type submersible drainage pump of non-corrosive material in close coupled design single stage, suitable for handling 20 - 40 mm(approx.) dia solids for transferring raw sewer from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump, start and stop push button contactor with required overload production and single phase preventer. |      |     |          |          |            | -          |
|       | Material of Construction (M.O.C):<br>Corrosion Resistant in general<br>: Casing — Cast Iron  |      |     |          |          |            | -          |
|       | : Impeller — Ductile cast iron/SS  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | : Bearings — Anti friction, prelubricated ball bearings, packed with grease for life.   |      |     |          |          |            | -          |
|       | Motor: — Dry Motor with built in over load protection   |      |     |          |          |            | -          |
|       | Protection - IP68.  |      |     |          |          |            | -          |
|       | Insulation Class - F  |      |     |          |          |            | -          |
|       | RAW SEWAGE PUMP   |      |     |          |          |            | -          |
|       | Capacity -600 LPM (min.) - 4 Nos  |      |     |          |          |            | -          |
|       | Head - 15 m   |      |     |          |          |            | -          |
| i.    | Solid handing - 20-40mm   |      |     |          |          |            | -          |
| ii.   | RAW SEWAGE PUMP Electrical & mechanical Works , excluding civil works (2 working+ 2 stand by) Total 4 Nos.  |      |     |          |          |            | -          |
| iii.  | Drainage Sump Pump-650LPM & 10 M head (3 Nos.)  |      |     |          |          |            | -          |
|       | Sludge recirculation pump: 200 LPM & 10 m Head(3 Nos.)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| f)    | RCC Equalization tank with hydraulic retention time Min.6 Hrs HRT of STP designing Average flow with suitable Size free Board 500 mm, the effluent of equalisation tank is agitated with diffused air that is fed by an air blower, including pipe non-corrosive material and its complete system.  |      |     |          |          |            | -          |
|       | Equalisation tank Electrical & mechanical Works , excluding civil works (Set-1)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| g)    | RCC Moving bed Bio Reactor ( MBBR) with minimum 5hr. retention time of STP designing Average flow rate for each reactor of suitable size with Air grid CPVC/SS -316 pipe material of construction or corrosion resistant material, Air diffusers (fine bubble), HDPE approved make Bio media for each aeration tank, with minimum water depth of 3.8 m. <b>(media size shall be approved by HSCC.)</b>  |      |     |          |          |            | -          |
|       | Moving bed Bio Reactor - Electrical & mechanical Works , excluding civil works -(4 nos.)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| h)    | ROTARY AIR BLOWERS  |      |     |          |          |            | -          |
|       | Providing and Installation of Rotary air blowers for air scouring, driver through v-belt or directly coupled through flexible coupling. Motor shall be of suitable HP for 400-440 volts, ,1500RPM, 3 phase, along with air filter, non-return valve, safety valve, base plate and necessary air piping fittings, valves, flowmeters etc.  |      |     |          |          |            | -          |
| h)    | (Blower capacity - 100 cfm at 4000 mm wc(minimum) shall be provided as per detail design calculation. It is use for equalisation tank and MBBR reactor - (2 working +2 stand by) Blowers shall be fully automatic. with fine bubble Air diffusers (tubeler type, Rating -5 -6 cfm at normal working condition, MOC diaphragm- Neoprene/silicon ) - Complete including Electrical & mechanical Works , excluding civil works.<br>Make of diffuser - Rehau, Techpro , OTT, MM Aqua<br>Make of Blowers- Kay, Everest , Usha , Swam |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | ROTARY AIR BLOWERS - Electrical & mechanical Works , excluding civil works( 4 nos. Blower &etc)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| i.)   | RCC secondary tube settler - maximum Hydraulic loading 1.75 cu.m/sq.m/hr. respectively and with approved quality media with minimum water depth of 2.4 m.+ Free board & hopper bottom. The lamina clarifier media shall be of acrylic plate min. 10 mm thick  |      |     |          |          |            | -          |
|       | Tube settler - Electrical & mechanical Works , excluding civil works (Set-2)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| j)    | Providing and fixing of OxiLyte (Mixed Oxidant) Generation System, based on ECA Technology, producing non toxic mixed Oxidant Solution 50 ltrs/hr at 1000 ppm of Oxidant Concentration . The solution should be at a pH 3+-0.5 suitable for 24x7 operations should produce 1200 litre per Day. The system should be supplied complete with appropriate dosing pumps , valves, piping, fittings, chemical dosing tank etc. complete in all respect. with auto flushing system. |      |     |          |          |            | -          |
|       | OxiLyte (Mixed Oxidant) Generation System - Electrical & mechanical Works , excluding civil works (Set-2)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | RCC supernatant tank/Filter feed tank minimum 280 cu.m capacity with following filter feed pumps -  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| j)    | FILTER FEED PUMPSETS  |      |     |          |          |            | -          |
|       | Providing and installation vertical inline single/multistage centrifugal pumping set with CI body, SS impeller, coupled with totally enclosed fan cooled induction motor mounted on common structural base plate with all pump accessories complete as per specifications inclusive rubber vibration eliminators motor suitable for 415 volts, 1500RPM, 3 phase 50 HZ. A/c supply.  |      |     |          |          |            | -          |
|       | Type of pump - Horizontal   |      |     |          |          |            | -          |
|       | Capacity -600 LPM (Mini.)   |      |     |          |          |            | -          |
|       | Head - 30 M   |      |     |          |          |            | -          |
|       | (2working +2stand by) - 4 nos.  |      |     |          |          |            | -          |
|       | Filter feed tank & Pumps - Electrical & mechanical Works , excluding civil works  |      |     |          |          |            | -          |
| k)    | MULTI GRADE FILTER  |      |     |          |          |            | -          |
|       | Providing and installation of mild steel pressure vessel ( as per IS:2825) 6 mm thick natural rubber lining fabrication standard multi grade filter complete in all respects, with dished ends, supporting legs, manhole cover, frontal pipe work fitting with valves. Plant shall be provided with inlet, outlet pressure gauge, sample cocks, charge of filter media graded sand and internals consisting of strainers fitted on plate for collection.                      |      |     |          |          |            | -          |
|       | Dia of vessel - 1200 mm (minimum)&1.6 m height  |      |     |          |          |            | -          |
|       | Shell thickness -6mm (minimum.)   |      |     |          |          |            | -          |
|       | Filtration rate - 20,000 lph/sqm ( min.) &  |      |     |          |          |            | -          |
|       | Dish end thickness-8mm (minimum.)   |      |     |          |          |            | -          |
|       | Nozzle plate -10mm thick (minimum.)   |      |     |          |          |            | -          |
|       | Manhole -450mm  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | Total capacity -700 LPM each Filter, complete (mini.)   |      |     |          |          |            | -          |
|       | MULTI GRADE FILTER - Electrical & mechanical Works , excluding civil works-2 nos.   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| i)    | ACTIVATED CARBON FILTER   |      |     |          |          |            | -          |
|       | Providing and installation of mild steel pressure vessel ( as per IS:2825) 6 mm thick natural rubber lining fabrication standard multi grade filter complete in all respects, with dished ends, supporting legs, manhole cover, frontal pipe work fitting with valves. Plant shall be provided with inlet, outlet pressure gauge, sample cocks, charge of approved quality activated carbon media. Provision of backwash and recharging of activated carbon etc. complete |      |     |          |          |            | -          |
|       | Depth of Activated carbon media- 1.0 m (Min.)   |      |     |          |          |            | -          |
|       | Activated carbon type-(950 IV 4/8 mesh)   |      |     |          |          |            | -          |
|       | Dia of vessel -1200mm (minimum)& 1.6 m ht.  |      |     |          |          |            | -          |
|       | Shell thickness -6mm (minimum.)   |      |     |          |          |            | -          |
|       | Dish end thickness-8mm (minimum.)   |      |     |          |          |            | -          |
|       | Nozzle plate -10mm thick (minimum.)   |      |     |          |          |            | -          |
|       | Manhole -450mm  |      |     |          |          |            | -          |
|       | capacity -700LPM,   |      |     |          |          |            | -          |
|       | ACTIVATED CARBON FILTER - Electrical & mechanical Works , excluding civil works-2 nos.  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| m)    | RCC 2 nos. Suitable size sludge sump of min. capacity 30 cu.m with min. free board 500 mm. The sludge of sludge sump is agitated with diffused air that is fed by an air blower (Common for MBBR tank), including pipe non-corrosive material and its complete system.  |      |     |          |          |            | -          |
|       | Cost of Screw type sludge feed pump set with CI body, SS screw and shaft coupled with to a totally enclosed fan cooled induction motor complete with CPVC / SS 304 piping's, sluice valves, non return valves, fittings etc as required. Motor suitable for 415 volts, 3 phase 50Hz. A/c supply with control auto start float switch / level controller for automatic operation - Electrical & mechanical Works , excluding civil works (2 Nos.)                          |      |     |          |          |            | -          |
|       | SLUDGE FEED PUMP-(2 Nos)  |      |     |          |          |            | -          |
|       | Capacity -200 LPM(minimum)  |      |     |          |          |            | -          |
|       | Head - 20 m   |      |     |          |          |            | -          |
|       | Type of pump - Screw type   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| n)    | Cost of centrifuge including drive, feeding arrangement, withdrawn arrangement, MOC- All wetted part SS 304, etc complete with PE Dosing System (Each set consist of 1 No. 500 ltr capacity dosing tank with 2 nos positive displacement dosing pump of min. capacity 50 LPH, CPVC / SS 304 pipings,valves, fittings etc as required(One set)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Capacity -300 LPM(minimum)  |      |     |          |          |            | -          |
|       | Type - Solid bowl   |      |     |          |          |            | -          |
|       | Make - Alfa, humboldt ,Penwalt  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | RCC 2 No. suitable size treated water tank of minimum 100 cu. M capacity with min.free board 500 mm(1 unit)   |      |     |          |          |            | -          |
|       | Treated Water Transfer Pump Sets  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| o)    | Ultra Filtration System (UF) - 2 Sets   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supplying, installing, testing and commissioning of UF System piping and Valves with all the required accessories & chemical cleaning system, complete in all respects.   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | UF Module (Hollow Fibre -outside in type porocity 0.04- 0.09 micron) including micron cartridge filter in SS 304, Pneumatic Valve, PLC Electrical Panel, flow meter, compressor and all other accessories making the system complete  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Flow rate : 12 cum/hr   |      |     |          |          |            | -          |
|       | Inlet TSS :- 20 mg/lt   |      |     |          |          |            | -          |
|       | Make : Norit, Toray, Koch, Dow  |      |     |          |          |            | -          |
|       | Membrane Type :- Pressure Feed Mambrane having life of atleast 4 years or 10 lac ppm hrs when compared with chlorine tolerance capacity in working hour with resect to PPM of chlorine dosing. Out to in process  |      |     |          |          |            | -          |
|       | No. of UF Membrane - As per Manufacturer  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | UF Feed Pump  |      |     |          |          |            | -          |
|       | Capacity : 15.0 m3/hr each (1W + 1S)  |      |     |          |          |            | -          |
|       | Head : 35 Mts (or as per manufacturer)  |      |     |          |          |            | -          |
|       | RPM : 2900  |      |     |          |          |            | -          |
|       | Motor Efficiency Class - IE2  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supply, installation, testing & commissioning of UF pre fine filtration. It can be micron filter or Bag filter or as per vendor design. The MOC of housing of filter shall be SS 304  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supplying, installing, testing, commissioning of centrifugal Vertical UF Backwash pumps with Complete SS - 304 with motor, pressure gauge with isolation cock, Isolation valve, NRV on delivery line. Isolation valve, strainer at suction. The pump shall be suitable for 415±10% volts 3 phase AC supply. |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Capacity : - 25.0 m3/hr   |      |     |          |          |            | -          |
|       | Head : - 35 m (or as per manufacturer)  |      |     |          |          |            | -          |
|       | No. of Pumps: 1 No.   |      |     |          |          |            | -          |
|       | Note-CIP pumps can be common with item no.c   |      |     |          |          |            | -          |
|       | Motor Efficiency Class - IE2  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supplying, Installation, testing and commissioning of compromising of Sintex Tank with inlet/ outlet connection, piping and valves alongwith metering pump of 0-25 LPH for dosing.  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       |   |      |     |          |          |            | -          |
|       | Supplying, Installation, testing and commissioning of CIP Dosing system comprising of Sintex Tank with inlet/ outlet connection, piping and valves alongwith metering pump of 0-12 LPH for dosing.  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supply installation commissioning of PLC control panel with all automation required like Pneumatic valves, piping in UPVC PLC and other required accessories.   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Supply, installation & commissioning of HDPE backwash tank of 2000 Litre capacity including required level controller   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Providing, fixing and testing of packaged type skid mounted hydropneumatic with VFD on every pump, system type comprising of :-   |      |     |          |          |            | -          |
|       | (i) Design, engineer, procure, supply, test and commission a pre-engineered, factory fabricated, assembled & tested, fully integrated, highly efficient pump, IE2 motors, skid mounted, complete ready-to-connect packaged pressure booster station, complete with vertical multi stage centrifugal pumps connected in parallel, high efficiency IE2 motors, intelligent multi-pump controller, the controller shall be mounted in a control cabinet with an IP 55 enclosure of suitable rating; SS304 suction and delivery manifolds; isolation ball valves on suction and discharge of each pump; non return valve on discharge side of each pump; hot dip galvanised common base frame; and diaphragm pressure vessel PN10 |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | (ii) The pump shall have cast iron head and base, SS304 impeller, SS304 Casing, SS316 Shaft   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | (iii) The motor shall be of efficiency class IE2, insulation class F, enclosure class IP55, capable of operation at 3 phase, 50 Hz, 380-415 V, with built-in thermistor PTC   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | (iv) Pressure vessel of non corrosive SS304 Food Grade. Air cell burst pressure of minimum of 5 times the vessel operating pressure and cycle tested for 2,50,000 cycles with minimum capacity of 100 Litres  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | (v) Control Panel to be of enclosure class IP41, with programmable logic controller (PLC) for cyclic operation of pumps. Pump working sequence should change after every operation. Contractor overload relays and MCBs should conform to IEC 898 – 1995/ specifications. Blinking indications for pumps start, trip, low level trip, health supply should be provided in the panel along with the ammeter & voltmeter. Control panel should also consist of cooling fan.   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
|       | (vi) Pressure tank capacity: (as per manufacturer recommendation) Note: Back up calculation need to be provided for the same. A pre-charged Carbon Steel body diaphragm tank shall be fitted to the discharge pipe with a compatible Butyl-rubber diaphragm. It shall supply water a very low flows to minimize frequent pump start and stop and water hammering. There shall be complete separation between water and air and there should be no contact between water and tank compounds to avoid corrosion. Bladders shall be suitable for sufficient elasticity to permit full expansion inside the tank to ensure better performance and longer working life. |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
|       | (vii) Pressure switches bellow type fitted with micro switch and having maximum pressure and differential scale should confirming BS-6134 standards and IP55 protection class.   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
|       | (viii) Ball valves to be used should be Hot Pressed brass OT-58 with stainless steel ball and P.T.F.E seal and O-Ring. NRVs to be used should be with Springs and O-Ring arrangement.  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
|       | Pressure Transmitter (0-10/16/25bar, based on system design pressure)  |      |     |          |          |            | -          |
|       | Pressurge Gauge - 0-16bar  |      |     |          |          |            | -          |
|       | Suction & Delivery Manifolds - SS304   |      |     |          |          |            | -          |
|       | One non-return valve and isolating valves for each pump is provided in delivery side and one isolating valve is provided in suction side.  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
|       | Complete set system to be mounted on a common base frame and shall follow following duty.  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| p)    | <b>Flushing water Hydropneumatic pumps</b>   |      |     |          |          |            | -          |
|       | System Peak Flow : 1000 LPM  |      |     |          |          |            | -          |
|       | Head : 80 M  |      |     |          |          |            | -          |
|       | no. of pumps: 2(2w+1s)   |      |     |          |          |            | -          |
|       | flow per pump : 500 LPM  |      |     |          |          |            | -          |
|       | Bladder Vessel : 200 lit   |      |     |          |          |            | -          |
|       | Skid Assembly with butterfly valves to isolate each pump,NRV for each pump, suction and discharge manifold in GI.Y strainer at suction of pump set with butterfly valve.   |      |     |          |          |            | -          |
|       | Starter VFD (IP 55 rated) for each pump with Microprocessor panel with wiring upto pumps and VFDs with Control Panel mounted on skid   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| q)    | Providing, fixing and testing of packaged type skid mounted hydropneumatic with VFD on every pump, system type comprising of :-  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | (i) Design, engineer, procure, supply, test and commission a pre-engineered, factory fabricated, assembled & tested, fully integrated, highly efficient pump, IE2 motors, skid mounted, complete ready-to-connect packaged pressure booster station, complete with vertical multi stage centrifugal pumps connected in parallel, high efficiency IE2 motors, intelligent multi-pump controller, the controller shall be mounted in a control cabinet with an IP 55 enclosure of suitable rating; SS304 suction and delivery manifolds; isolation ball valves on suction and discharge of each pump; non return valve on discharge side of each pump; hot dip galvanised common base frame; and diaphragm pressure vessel PN10 |      |     |          |          |            | -          |
|       | (ii) The pump shall have cast iron head and base, SS304 impeller, SS304 Casing, SS316 Shaft   |      |     |          |          |            | -          |
|       | (iii) The motor shall be of efficiency class IE2, insulation class F, enclosure class IP55, capable of operation at 3 phase, 50 Hz, 380-415 V, with built-in thermistor PTC   |      |     |          |          |            | -          |
|       | (iv) Pressure vessel of non corrosive SS304 Food Grade. Air cell burst pressure of minimum of 5 times the vessel operating pressure and cycle tested for 2,50,000 cycles with minimum capacity of 100 Litres  |      |     |          |          |            | -          |
|       | (v) Control Panel to be of enclosure class IP41, with programmable logic controller (PLC) for cyclic operation of pumps. Pump working sequence should change after every operation. Contractor overload relays and MCBs should confirm to IEC 898 – 1995/ specifications. Blinking indications for pumps start, trip, low level trip, health supply should be provided in the panel along with the ammeter & voltmeter. Control panel should also consist of cooling fan.   |      |     |          |          |            | -          |
|       | (vi) Pressure tank capacity: (as per manufacturer recommendation) Note: Back up calculation need to be provided for the same. A pre-charged Carbon Steel body diaphragm tank shall be fitted to the discharge pipe with a compatible Butyl-rubber diaphragm. It shall supply water a very low flows to minimize frequent pump start and stop and water hammering. There shall be complete separation between water and air and there should be no contact between water and tank compounds to avoid corrosion. Bladders shall be suitable for sufficient elasticity to permit full expansion inside the tank to ensure better performance and longer working life.  |      |     |          |          |            | -          |
|       | (vii) Pressure switches bellow type fitted with micro switch and having maximum pressure and differential scale should confirming BS-6134 standards and IP55 protection class.  |      |     |          |          |            | -          |
|       | (viii) Ball valves to be used should be Hot Pressed brass OT-58 with stainless steel ball and P.T.F.E seal and O-Ring. NRVs to be used should be with Springs and O-Ring arrangement.   |      |     |          |          |            | -          |



| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | Pressure Transmitter (0-10/16/25bar, based on system design pressure)   |      |     |          |          |            | -          |
|       | Pressurge Gauge - 0-16bar   |      |     |          |          |            | -          |
|       | Suction & Delivery Manifolds - SS304  |      |     |          |          |            | -          |
|       | One non-return valve and isolating valves for each pump is provided in delivery side and one isolating valve is provided in suction side.   |      |     |          |          |            | -          |
|       | Complete set system to be mounted on a common base frame and shall follow following duty.   |      |     |          |          |            | -          |
| q.i)  | <b>Domestic water Hydropneumatic pumps + Feeding to Cooling tower for OPD</b>   |      |     |          |          |            | -          |
|       | System Peak Flow : 1000 LPM   |      |     |          |          |            | -          |
|       | Head : 35 M   |      |     |          |          |            | -          |
|       | no. of pumps: 3 (2w+1s)   |      |     |          |          |            | -          |
|       | flow per pump : 500 LPM   |      |     |          |          |            | -          |
|       | Bladder Vessel : 500 lit  |      |     |          |          |            | -          |
|       | Skid Assembly with butterfly valves to isolate each pump,NRV for each pump, suction and discharge manifold in GI.Y strainer at suction of pump set with butterfly valve.  |      |     |          |          |            | -          |
|       | Starter VFD (IP 55 rated) for each pump with Microprocessor panel with wiring upto pumps and VFDs with Control Panel mounted on skid  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| r)    | Providing and fixing, testing and commissioning M.S. Vertical Up flow "Cation" Ion Exchange water Softener fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8mm thick M.S. plate on dished ends as per applicable IS standards. The vessel shall be internally lined with 6.00 mm thick rubber, tested to 60 - 80 shore hardness, 15000 RMS volts spark test for continuity. The softener shall have : |      |     |          |          |            | -          |
|       | a) Strainer plates at top and bottom with P.P. strainers with removable nuts and check nuts fixed on the plates.  |      |     |          |          |            | -          |
|       | b) GI/CPVC heavy class fabricated internally rubber lined face piping comprising of connections with CI Diaphragm Valves of required size for inlet, outlet, and rinse drain etc.   |      |     |          |          |            | -          |
|       | c) Regeneration assembly comprising of power valve, ejector, brine suction valve, and all necessary piping incorporated into the main pipework.   |      |     |          |          |            | -          |
|       | d) Pressure gauges (100 mm dia bourdon type pressure gauge ) / Sampling points with SS isolation cocks at inlet and outlet.   |      |     |          |          |            | -          |
|       | e) All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint .  |      |     |          |          |            | -          |
|       | f) The softener shall be complete with all gaskets / fasteners of standard quality as required.   |      |     |          |          |            | -          |
|       | g) Initial charge of Ion Exchange resin.  |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|       | h) The softener shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein.  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | i) M.S. rubber lined vertical, cylindrical self supporting open tank for salt mixing and brine saturation with air agitation arrangement comprising of G. I. heavy class air distributor laid at the bottom of tank, roots type air blower complete in all respects of suitable capacity to agitate the required quantity of brine, piping interconnection between air blower and air distributor. The brine tank to have nozzles for outlet, overflow and drain. Outside finished with high gloss enamel paint over two coats of zinc chromate primer complete including testing and commissioning. Net usable capacity of the tank excluding free board etc., should be at least 10 % more than actual capacity required. |      |     |          |          |            | -          |
|       | <b>Capacity of softening plant : 1000 LPM</b>   |      |     |          |          |            | -          |
|       | Raw Hardness : 700-1500 mg/l.   |      |     |          |          |            | -          |
|       | Regeneration period interval not less than 12 hr.   |      |     |          |          |            | -          |
|       | Quantity of soft water between two regenerations = As per Design  |      |     |          |          |            | -          |
|       | Approximate Dia = 1200 mm, HOS 1600 mm (min.) or as required  |      |     |          |          |            | -          |
|       | Type of Resin : Strongly acidic cation resin  |      |     |          |          |            | -          |
|       | Make of Resin : Ion Exchange / Rohm & Haas  |      |     |          |          |            | -          |
|       | Min. qty. of resin : 3500 Ltrs. Or as per Design  |      |     |          |          |            | -          |
|       | Operating pressure : 2.5-3.0 kg/sqcm  |      |     |          |          |            | -          |
|       | Test pressure : 5.50 kg/sqcm  |      |     |          |          |            | -          |
|       | Soft water quality: Commercial zero hardness(less than 10 ppm)  |      |     |          |          |            | -          |
|       | Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 (Heavy class) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers.  |      |     |          |          |            | -          |
|       | 65/80 mm dia ( min.) ( Interconnection between units )/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
|       | Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).  |      |     |          |          |            | -          |
|       | 80 mm dia (min.) (as per required length)   |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| s)    | FILTER FEED PUMPSETS  |      |     |          |          |            | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|--|------|-----|----------|----------|------------|------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7          | 8          |
|       | Providing and installation vertical inline single/multistage centrifugal pumping set with CI body, SS impeller, coupled with totally enclosed fan cooled induction motor mounted on common structural base plate with all pump accessories complete as per specifications inclusive rubber vibration eliminators motor suitable for 415 volts, 1500RPM, 3 phase 50 HZ. A/c supply.   |      |     |          |          |            | -          |
|       | Type of pump - Horizontal  |      |     |          |          |            | -          |
|       | Capacity - 600LPM (Mini.)  |      |     |          |          |            | -          |
|       | Head - 35 M  |      |     |          |          |            | -          |
|       | (2working +1stand by) - 3 nos.   |      |     |          |          |            | -          |
|       | Filter feed tank & Pumps - Electrical & mechanical Works , excluding civil works   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| t)    | Providing and fixing vertical in line SS centrifugal pumps with CI volute and SS impeller and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer ( Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency ) |      |     |          |          |            | -          |
| i.    | Irrigation Pump in STP   |      |     |          |          |            | -          |
|       | Capacity :(500 lpm (Each)  |      |     |          |          |            | -          |
|       | Head : 45 m  |      |     |          |          |            | -          |
|       | Power : 10.0 HP  |      |     |          |          |            | -          |
|       | with 100% standby pumps(1W+1S) 2 Nos.  |      |     |          |          |            | -          |
| ii.   | Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent)   |      |     |          |          |            | -          |
|       | 50/80 mm dia (min.) or required size and required number( 1 Set)   |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| iii.  | Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto or equivalent)  |      |     |          |          |            | -          |
|       | 80/50 mm NB (min.) or required size and number(1 Set)  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| iv.   | Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.  |      |     |          |          |            | -          |
|       | 80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery)  |      |     |          |          |            | -          |
|       |  |      |     |          |          |            | -          |
| v)    | 1# RCC Treated water tank of minimum 150 cu.m capacity with min. free board 500 mm(1 unit)   |      |     |          |          |            | -          |
| vi)   | 1# RCC UF Permeate tank of minimum 150 cu.m capacity with min. free board 500 mm(1 unit)   |      |     |          |          |            | -          |

| S. No | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------|---|------|-----|----------|----------|------------|------------|
| 1     | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
| vii)  | Providing and fixing Hydropneumatic filter press of 24 plates 1000 x 1000mm size, with suitable sludge pump(screw type) along with piping, fittings valve etc. complete in all respects.  |      |     |          |          |            | -          |
| viii) | Filter press & sludge pump(screw type) with SS Shaft and Rotor - 3 m3/Hr, 40 m Head - Electrical & mechanical Works , excluding civil works(Set-I)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| u)    | Providing and fixing dust and vermine proof cubical type motor control panel center for the various pumps, blower etc. required. It is fabricated from 2mm thick CRCA sheet with stove enamelled finish and comprising of: Panel should have at least 20% spare feeders.  |      |     |          |          |            | -          |
| i.    | One incoming main of 500 A MCCB or of required  |      |     |          |          |            | -          |
| ii.   | MCCB/MPCB, one for each motor   |      |     |          |          |            | -          |
| iii.  | Fully automatic DOL/star delta starters suitable for different motors/pumps/exhaust fans used in the ETP. Upto 7.5 HP DOL may be used and above star/delta starter used with push buttons one for each motor and on/off indicating neon lamps.  |      |     |          |          |            | -          |
| iv.   | Single phasing preventers of appropriate rating for each motor.   |      |     |          |          |            | -          |
| v.    | rotary type selector switch   |      |     |          |          |            | -          |
| vi.   | Panel type ampere meters, one for each motor shall be with rotary selector switch to monitor line currents.   |      |     |          |          |            | -          |
| vii.  | Panel type volt meters, on incoming main with rotary selecting switch to monitor voltage between phase to neutral and phase to phase.   |      |     |          |          |            | -          |
| viii. | Neon phase indicating lamps and indicating lamp for each motor on incoming mains.   |      |     |          |          |            | -          |
| ix.   | Rotary switch for manual or auto operation for each pump  |      |     |          |          |            | -          |
| x.    | Fully taped separate aluminum bus bar of required capacity for normal and emergency supply.   |      |     |          |          |            | -          |
| xi.   | The panel shall be pre-wired with coded wiring. All intercnnting wiring from incoming main to switchgear, meters and accessories within the switchboard panel shall have suitable copper ferrules (Complete 1 set)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| v)    | Electrical works (including supply, installation and termination of cables of suitable size as per HP of all pumps with all structural supports, clamps and cable trays as per approved design/specifications, installation will be as per relevant Indian standard and CPWD specification along with control cable of suitable size).(1 lot). Axial exhaust Fan GI Sheet ducting for desire ventilation of Pump Room area as per approved Drawings. Any other electrical and mechanical item required to complete the work.(Set-1) |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| i)    | Providing and fixing digital type flow meter and energy meter etc. complete in all respects. (Set-1)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |
| ii)   | Providing and fixing lab. Equipments including digital type pH meter, COD kit, TDS kit, bicker, conical flask etc. complete in all respects. (Set-1)  |      |     |          |          |            | -          |
|       |   |      |     |          |          |            | -          |

| S. No | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount     | NSR Amount     |
|-------|--|------|-----|----------|----------|----------------|----------------|
| 1     | 2  | 3    | 4   | 5        | 6        | 7              | 8              |
| iii)  | Rooms for Pumps & control panel (100 sq.m. ) (minimum size) - Electrical & mechanical Works , Ventilation fan & ducts with minimum air change 20 CFM and lighting etc.,excluding civil works.(Set-1)   |      |     |          |          |                | -              |
|       |  |      |     |          |          |                | -              |
| iv)   | Note: The cost of chemical & manpower for trial run for period of two month from the date of handing over obtaining approval from Local Pollution Department including the cost of consumables complete as specification as directed .Obtain required no. of test report of treated/raw sewer during trial run. Any part of equipment require to complete the STP system will be considered the part of this item. No additional payment shall be made on this account.  |      |     |          |          |                | -              |
|       | Complete STP work as mentioned above   | Set  | 1   |          |          | 1,86,80,569.00 | 1,86,80,569.00 |
|       |  |      |     |          |          |                | -              |
|       | SUB TOTAL(Sewage Treatment Plant)-[Total of Sub Head STP(i) to (xxi)]  |      |     |          |          |                | -              |
|       |  |      |     |          |          |                | -              |
| 14.02 | Providing and fixing vertical in line SS centrifugal pumps with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer ( Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency ) |      |     |          |          |                | -              |
|       | <b>Soft water transfer pump STP to fill Soft water tank</b>  |      |     |          |          |                | -              |
|       | Capacity : 750 lpm (Each)  |      |     |          |          |                | -              |
|       | Head : 35 m  |      |     |          |          |                | -              |
|       | Power : 10.0 HP  |      |     |          |          |                | -              |
|       | with 100% standby pumps(2W+1S) 2 Nos.  |      |     |          |          |                | -              |
|       | Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent)   |      |     |          |          |                | -              |
|       | 50/80 mm dia (min.) or required size and required number( 1 Set)   |      |     |          |          |                | -              |
|       |  |      |     |          |          |                | -              |
|       | Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto or equivalent)  |      |     |          |          |                | -              |
|       | 80/50 mm NB (min.) or required size and number(1 Set)  |      |     |          |          |                | -              |
|       |  |      |     |          |          |                | -              |
|       | Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.  |      |     |          |          |                | -              |
|       | 80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery)  | Set  | 1   |          |          | 1,77,876.00    | 1,77,876.00    |
|       |  |      |     |          |          |                | -              |

| S. No     | Item Description  | Unit  | Qty | DSR Rate | NSR Rate  | DSR Amount | NSR Amount            |
|-----------|---|-------|-----|----------|-----------|------------|-----------------------|
| 1         | 2   | 3     | 4   | 5        | 6         | 7          | 8                     |
| 14.03     | Operation and maintenance Cost (STP & ETP)  |       |     |          |           |            | -                     |
|           | Testing charges of Raw and treated effluent for all the required parameter from approved lab (after defect and liability period)  | Set   | 1   |          | 10,000.00 |            | 10,000.00             |
|           |   |       |     |          |           |            | -                     |
|           | Providing chemical and consumables for satisfactory operation of STP etc. completed in all respect in all respect excluding cost of electricity and manpower and spare parts during defect liability period i.e. 1 year and also including the cost for providing the on plant training to the respective personnel's for operation and maintenance of STP.   | Month | 12  |          | 4,167     |            | 50,000.00             |
|           |   |       |     |          |           |            | -                     |
|           | Providing (operator & one Helper) i.e. manpower to operate the STP in each shift. In case the additional manpower required for proper operation, the same will be considered as part of this item only.   |       |     |          |           |            | -                     |
|           | Helper - 3 no./day(i.e one in each shift)   | Month | 12  |          | 30,600    |            | 3,67,200.00           |
|           | technical operator - 2 no./day  | Month | 12  |          | 34,000    |            | 4,08,000.00           |
|           | Supervisor (1 No. Per day)  | Month | 12  |          | 21,250    |            | 2,55,000.00           |
|           | AMC of all equipment's, components and spares of STP after one year defect liability period. The consumables will be reimbursed by owner as per actual cost.  | Year  | 2   |          | 5,52,500  |            | 11,05,000.00          |
|           |   |       |     |          |           |            | -                     |
|           | <b>Subtotal (O &amp; M)</b>   |       |     |          |           | -          | -                     |
|           |   |       |     |          |           |            | -                     |
|           | <b>Grand total STP (Including O&amp;M)</b>  |       |     |          |           | -          | <b>2,10,53,645.00</b> |
|           |   |       |     |          |           |            | -                     |
| <b>15</b> | <b>ELECTRICAL INSTALLATION FOR PLUMBING SYSTEM</b>  |       |     |          |           |            | -                     |
|           |   |       |     |          |           |            | -                     |
| 15        | <b>Water Supply Pump(PANEL)</b>   |       |     |          |           |            | -                     |
|           | <b>Water Supply Pump</b>  |       |     |          |           |            | -                     |
|           | Supply, installation, testing and commissioning of following M.V. cubicle type totally enclosed, powder coated, Free standing type, dust, damp and vermin proof, indoor type Distribution Board/Panel complete with busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, and having following incoming and outgoing switchgears complete as technical specification & as required. |       |     |          |           |            | -                     |
|           | <b>Note :</b>   |       |     |          |           |            | -                     |
|           | All MCCBs shall have Ics=Icu =100%  |       |     |          |           |            | -                     |
|           |   |       |     |          |           |            | -                     |
| <b>A</b>  | <b>INCOMER :</b>  |       |     |          |           |            | -                     |
|           | 800 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB microprocessor based, with O/L, S/C & inbuilt E/F protection release.   |       |     |          |           |            | -                     |
|           | Phase indicating lamp (LED type) with 6A control SP MCB   |       |     |          |           |            | -                     |
|           | "ON" ,"OFF" and "TRIP" LED indicating lamp and 6A control SP MCBs   |       |     |          |           |            | -                     |
|           | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |       |     |          |           |            | -                     |

| S. No       | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------------|---|------|-----|----------|----------|------------|------------|
| 1           | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|             | 1 no. Digital voltmeter.  |      |     |          |          |            | -          |
|             | 1 no Digital ammeter with one set of suitable C.T. s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
|             | <b>BUSBARS :</b>  |      |     |          |          |            | -          |
|             | 1000 Amp TPN busbars of Aluminium   |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>B</b>    | <b>OUTGOINGS :</b>  |      |     |          |          |            | -          |
| <b>i)</b>   | <b>1 Sets of Filter Feed Pumps (3W+3S) - 6 Outgoings</b>  |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.  |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 NOs. 3 Phase, DOL starter of 10 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required.        |      |     |          |          |            | -          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>ii)</b>  | <b>1 Sets of Softner Feed Pumps (3W+3S) - 6 Outgoings</b>   |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.  |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 NOs. 3 Phase, Star-Delta starter of 15 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. |      |     |          |          |            | -          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>iii)</b> | <b>1 Sets of Domestic Hydro-pneumatic Pumps (3W+3S) - 1 Outgoing</b>  |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.  |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 NOs. 3 Phase, Star-Delta starter of 75 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. |      |     |          |          |            | -          |

| S. No       | Item Description  | Unit | Qty | DSR Rate | NSR Rate | DSR Amount | NSR Amount |
|-------------|---|------|-----|----------|----------|------------|------------|
| 1           | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>iv)</b>  | <b>1 Sets of Soft Water Hydro-pneumatic Pumps (3W+3S) - 1 Outgoing</b>  |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.  |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 NOs. 3 Phase, Star-Delta starter of 75 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. |      |     |          |          |            | -          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>v)</b>   | <b>1 Sets of Flushing Water Pumps (2W+1S) - 3 Outgoings</b>   |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.  |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 NOs. 3 Phase, Star-Delta starter of 25 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. |      |     |          |          |            | -          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>vi)</b>  | <b>4 Sets of following Drainage Pump for Basement drainage (1W+1S) - 4 Outgoings</b>  |      |     |          |          |            | -          |
|             | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.   |      |     |          |          |            | -          |
|             | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          |            | -          |
|             | 1 no 3 Phase, DOL starter of 6 HP with thermal overload relay with inbuilt single phase preventor , contactor, Push Buttons and Switches etc complete as required.  |      |     |          |          |            | -          |
|             | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          |            | -          |
|             | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          |            | -          |
|             |   |      |     |          |          |            | -          |
| <b>vii)</b> | <b>1 Sets of following Drainage Pump for Plant Room drainage (1W+1S) - 1 Outgoing</b>   |      |     |          |          |            | -          |



| S. No        | Item Description   | Unit | Qty | DSR Rate | NSR Rate | DSR Amount   | NSR Amount   |
|--------------|--|------|-----|----------|----------|--------------|--------------|
| 1            | 2  | 3    | 4   | 5        | 6        | 7            | 8            |
|              | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.      |      |     |          |          |              | -            |
|              | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.                |      |     |          |          |              | -            |
|              | 1 no 3 Phase, DOL starter of 6 HP with thermal overload relay with inbuilt single phase preventor , contactor, Push Buttons and Switches etc complete as required. |      |     |          |          |              | -            |
|              | LED indicating Lamps for "ON" , "OFF" & "TRIP".  |      |     |          |          |              | -            |
|              | Digital ammeter with one set of suitable cast resin C.T' s   |      |     |          |          |              | -            |
|              |  |      |     |          |          |              | -            |
| <b>viii)</b> | <b>1 Sets of following Sewage Pump for Basement Toilet (1W+1S) - 1 Outgoing</b>  |      |     |          |          |              | -            |
|              | Suitable Rated. 415 volts, 35 KA (Ics=Icu), TPN MCCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.      |      |     |          |          |              | -            |
|              | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.                |      |     |          |          |              | -            |
|              | 1 no 3 Phase, DOL starter of 4 HP with thermal overload relay with inbuilt single phase preventor , contactor, Push Buttons and Switches etc complete as required. |      |     |          |          |              | -            |
|              | LED indicating Lamps for "ON" , "OFF" & "TRIP".  |      |     |          |          |              | -            |
|              | Digital ammeter with one set of suitable cast resin C.T' s   |      |     |          |          |              | -            |
|              |  |      |     |          |          |              | -            |
| <b>ix)</b>   | <b>6 Sets of following (Tube Well Pump 20 HP)</b>  |      |     |          |          |              | -            |
|              | 63 Amp. 415 volts, 35 KA (Ics=Icu), TPN MCCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.              |      |     |          |          |              | -            |
|              | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.                |      |     |          |          |              | -            |
|              | Digital ammeter with one set of suitable CT,s.   |      |     |          |          |              | -            |
|              | LED indicating Lamps for "ON" , "OFF" & "TRIP".  |      |     |          |          |              | -            |
|              |  |      |     |          |          |              | -            |
| <b>x)</b>    | <b>4 Sets of following (Spare)</b>   |      |     |          |          |              | -            |
|              | 63 Amp. 415 volts, 35 KA (Ics=Icu), TPN MCCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.              |      |     |          |          |              | -            |
|              | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.                |      |     |          |          |              | -            |
|              | Digital ammeter with selector switch with one set of suitable CT,s.  |      |     |          |          |              | -            |
|              | LED indicating Lamps for "ON" , "OFF" & "TRIP" .   |      |     |          |          |              | -            |
|              | Digital ammeter with one set of suitable CT,s.   |      |     |          |          |              | -            |
|              |  |      |     |          |          |              | -            |
|              | <b>Water supply PUMP PANEL in pump room as above</b>   | Set  | 1   |          |          | 12,66,027.00 | 12,66,027.00 |
|              |  |      |     |          |          |              | -            |
| <b>15.02</b> | <b>Starter for Tubewell</b>  |      |     |          |          |              | -            |

| <b>S. No</b> | <b>Item Description</b>   | <b>Unit</b> | <b>Qty</b> | <b>DSR Rate</b> | <b>NSR Rate</b> | <b>DSR Amount</b> | <b>NSR Amount</b>   |
|--------------|---|-------------|------------|-----------------|-----------------|-------------------|---------------------|
| <b>1</b>     | <b>2</b>  | <b>3</b>    | <b>4</b>   | <b>5</b>        | <b>6</b>        | <b>7</b>          | <b>8</b>            |
|              | 1 nos . 3 Phase, fully automatic star Delta starter of 20HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. | each        | 6          |                 | 51,765.00       |                   | 3,10,590.00         |
|              |   |             |            |                 |                 |                   | -                   |
|              | <b>TOTAL CARRIED TO SUMAMRY</b>   |             |            |                 |                 |                   | <b>15,76,617.00</b> |

**Name of Work : Firefighting Works for Construction of hospital & Academic Campus of All India Institute of Medical Sciences (AIIMS) at Guntur.**

**MAIN ABSTRACT SHEET**

| <b>A</b>                  |                    |                        |                       |
|---------------------------|--------------------|------------------------|-----------------------|
| <b>FIREFIGHTING WORKS</b> |                    |                        |                       |
| <b>Sr.No.</b>             | <b>SUB - HEADS</b> | <b>DSR Amount (Rs)</b> | <b>NSR Amount(Rs)</b> |
| 1.00                      | FIRE FIGHTING      | 32,682,979.47          | 109,385,522.26        |
|                           |                    |                        |                       |
|                           | <b>TOTAL</b>       | <b>32,682,979.00</b>   | <b>109,385,522.00</b> |
|                           |                    |                        |                       |
|                           | <b>GRAND TOTAL</b> | <b>142,068,501.00</b>  |                       |

**ABSTRACT OF COST FOR FIREFIGHTING WORKS**

Name of Work : Firefighting Works for Construction of hospital & Academic Campus of All India Institute of Medical Sciences (AIIMS) at Guntur.

| Sr. No.  | Item Description  | Unit    | Qty     | DSR Rate  | NSR Rate | NSR Amount   | DSR Amount |
|--|---|---------|---------|-----------|----------|--------------|------------|
| 1  | 2   | 3       | 4       | 5         | 6        | 7            | 8          |
| <b>Note: Based on the tender drawing the agency has to prepare the internal &amp; external fire fighting shop drawing and obtain the approval of the same before start of work</b> |   |         |         |           |          |              |            |
| <b>1</b>   | <b>FIRE FIGHTING SYSTEM</b>   |         |         |           |          |              |            |
| 1.01   | Providing and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329 :   |         |         |           |          |              |            |
| a  | 100 mm dia Ductile Iron Double Flanged pipe- class K-9  | Metre   | 530     | 958.95    |          | 508,243.50   | -          |
| b  | 150 mm dia Ductile Iron Double Flanged pipe- class K-9  | Metre   | 5750    | 1,438.35  |          | 8,270,512.50 | -          |
| c  | 200 mm dia Ductile Iron Double Flanged pipe- class K-9  | Metre   | 4500    | 1,978.85  |          | 8,904,825.00 | -          |
|  |   |         |         |           |          | -            | -          |
| 1.02   | Providing and laying D.I. specials of class K-12 suitable for push -on jointing (Flange Joint) as per IS : 9523   |         |         |           |          |              |            |
| a  | Upto 600 mm dia   | Quintal | 510.32  | 15,394.40 |          | 7,856,070.21 | -          |
|  |   |         |         |           |          | -            | -          |
| 1.03   | Providing and laying D.I. specials of class K-12 suitable for Mechanical joint(Flange Joint) as per IS : 9523   |         |         |           |          |              |            |
| a  | Upto 600 mm dia   | Quintal | 120.52  | 16,207.45 |          | 1,953,321.87 | -          |
|  |   |         |         |           |          | -            | -          |
| 1.04   | Providing push on - joints to centrifugally (spun) Ductile Iron Pipes including testing of joints and the cost of rubber gasket etc complete in all respect.  |         |         |           |          |              |            |
| a  | 100 mm dia pipes  | Joints  | 94.6    | 65.10     |          | 6,158.46     | -          |
| b  | 150 mm dia pipes  | Joints  | 2467.85 | 102.35    |          | 252,584.45   | -          |
| c  | 200 mm dia pipes  | Joints  | 965.45  | 154.30    |          | 148,968.94   | -          |
|  |   |         |         |           |          | -            | -          |
| 1.05   | Providing and laying Double Flanged(Screwed/Welded ) Centrifugally(Spun) Ductile Iron pipes of Class K-9 conforming to IS:8329  |         |         |           |          |              |            |
| a  | 100 mm dia pipes  | Metre   | 10      | 1,377.45  |          | 13,774.50    | -          |
| b  | 150 mm dia pipes  | Metre   | 100     | 2,067.10  |          | 206,710.00   | -          |
|  |   |         |         |           |          | -            | -          |
| 1.06   | Excavating trenches of required width for pipes, cables etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5m including getting out the excavated soil, and then returning the soil as required, inlayers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed within a lead of 50 m |         |         |           |          |              |            |
| a  | Pipes, cables etc exceeding 80 mm dia but not exceeding 300 mm dia  | Metre   | 9193    | 225.45    |          | 2,072,561.85 | -          |
|  |   |         |         |           |          | -            | -          |

| Sr. No. | Item Description  | Unit  | Qty   | DSR Rate | NSR Rate  | NSR Amount | DSR Amount   |
|---------|---|-------|-------|----------|-----------|------------|--------------|
| 1       | 2   | 3     | 4     | 5        | 6         | 7          | 8            |
| 1.07    | Providing, fixing and testing and commissioning of <b>GI pipes Class 'C'</b> (heavy duty) of approved make conforming to IS 1239-1982 complete with G.I. fittings such as tees, crosses, plugs, sockets, elbows, reducers, unions, sleeve pieces, check nuts etc including jointing with C.I. pipes (wherever required), cutting & making good the walls, floors, R.C.C. work etc. including cutting chases & filling the same, painting the GI pipes with two coats of bitumastic paint, wrapping with one layer of polythene tape. 400 micron thick and applying a final coat of bittumestic paint complete including surface preparation. <b>(Pipe running under ground)</b> |       |       |          |           |            |              |
| a)      | 150 mm dia G.I. Pipe with flange joints (5.4 mm wall thickness)   | Metre | 1250  |          | 1,849.92  | -          | 2,312,394.27 |
| b)      | 100 mm dia G.I. Pipe with flange joints   | Metre | 450   |          | 1,418.55  | -          | 638,346.91   |
| c)      | 80 mm dia G.I. Pipe with flange joints  | Metre | 500   |          | 994.87    | -          | 497,433.66   |
|         |   |       |       |          |           | -          | -            |
| 1.08    | <b>Heavy class G.I. pipes</b> conforming to IS with accessories like tees, elbows, flanged joints, rubber insertion, nuts, bolts or welded joints including fixing the pipe with suitable flat iron strip clamps/brackets, structural members, dash fastener, cutting hole and chases in walls, floor, R.C.C. slab etc. and making good the same, including painting pipes and fittings with a primer coat of steel primer and two coats of postal red enamel paint etc. complete as required. (All the fitting i.e. tee /elbow, Valve shall be joint the pumps will flanged joints)  |       |       |          |           |            |              |
| a)      | 300 mm dia (with Flanged joints) IS: 3589 thick 6.35 mm   | Metre | 45    |          | 3,718.66  | -          | 167,339.54   |
| b)      | 200 mm dia (with Flanged joints) IS: 3589 thick 6 mm  | Metre | 160   |          | 2,600.14  | -          | 416,022.36   |
| c)      | 150 mm dia (with Flanged joints) IS: 1239 thick 5.4 mm  | Metre | 5170  |          | 1,767.53  | -          | 9,138,128.76 |
| d)      | 100 mm dia (with Flanged joints)  | Metre | 5000  |          | 1,224.02  | -          | 6,120,111.27 |
| e)      | 80 mm dia   | Metre | 5795  |          | 893.64    | -          | 5,178,652.64 |
| f)      | 65 mm dia   | Metre | 3060  |          | 743.25    | -          | 2,274,332.03 |
| g)      | 50 mm dia   | Metre | 5795  |          | 592.53    | -          | 3,433,694.18 |
| h)      | 40 mm dia   | Metre | 4620  |          | 463.56    | -          | 2,141,642.01 |
| i)      | 32 mm dia   | Metre | 335   |          | 408.43    | -          | 136,823.53   |
| j)      | 25 mm dia   | Metre | 23595 |          | 338.70    | -          | 7,991,549.08 |
|         |   |       |       |          |           | -          | -            |
| 1.09    | Providing & fixing fire authority approved <b>Aluminium shutter</b> (size 1200 (L) x 2100 (H) mm ), The shutter size shall be as per approved drawing capable of accommodating fire hose reel, fire hydrant, hose pipe, fittings & accessories. The box shall have a single or double glazed front glass door (with 4 mm thick glass) with lock & key arrangement & shall be painted with Fire red as per IS:5, shade no. 536 complete in all respects. (For Internal Hydrant) (Excluding the cost of alluminium work which will be paid as per civil work items)   | Each  | 150   |          | 21,559.00 | -          | 3,233,850.00 |
|         |   |       |       |          |           | -          | -            |
| 1.10    | Supplying and Fixing <b>First Aid Hose Reel</b> , wall mounting swinging type complete with drum & bracket of MS construction, spray painted in Post office Red, conforming to IS 884/1995 with upto date amendments, complete with the following as required.  |       |       |          |           |            |              |
|         |   |       |       |          |           | -          | -            |

| Sr. No. | Item Description   | Unit | Qty | DSR Rate | NSR Rate  | NSR Amount | DSR Amount   |
|---------|--|------|-----|----------|-----------|------------|--------------|
| 1       | 2  | 3    | 4   | 5        | 6         | 7          | 8            |
|         | 36 Meter long 20 mm dia water hose Thermoplastic (Textile reinforced) Type - 2 as per IS : 12585   |      |     |          |           | -          | -            |
|         | 20 mm dia gun metal ball valve & nozzle.   |      |     |          |           | -          | -            |
|         | Drum and brackets for fixing the equipments on wall.   |      |     |          |           | -          | -            |
|         | Connection from riser with stop valve (gun metal) & M.S. Pipe  | Each | 150 |          | 10,038.00 | -          | 1,505,700.00 |
|         |  |      |     |          |           | -          | -            |
| 1.11    | Supplying and Fixing of <b>Fire Man's axe</b> with heavy insulated rubber as per standard conforming to IS 926   | Each | 150 |          | 1,267.00  | -          | 190,050.00   |
|         |  |      |     |          |           | -          | -            |
| 1.12    | Fabricating, Supplying, Installation, Testing and Commissioning <b>Air Vessel</b> of continuous welded construction with flanged discharge header on the top of each riser fabricated out of 10 mm thick dished ends and 8 mm thick MS sheet, Air Release Valve complete with suitable drain arrangement with 25 mm dia gun metal wheel valve complete with all accessories etc. as required of the following sizes  |      |     |          |           | -          | -            |
| a)      | 1.2 Metre high and 250 mm dia  | Each | 34  |          | 32,851.00 | -          | 1,116,934.00 |
| b)      | 2 Metre high and 450 mm dia suitable to operate Jockey Pump, Main Fire Pump & Diesel Engine Driven Fire Pump   | Each | 2   |          | 45,520.00 | -          | 91,040.00    |
|         |  |      |     |          |           | -          | -            |
| 1.13    | Providing and fixing 25mm dia. Gunmetal <b>Air Release valve</b> , single acting including the cost of 25mm gate valve, Pressure gauge, all pipes and fittings as per standard design complete in all respects.  | Each | 50  |          | 3,592.00  | -          | 179,600.00   |
|         |  |      |     |          |           | -          | -            |
| 1.14    | Supplying and fixing of weather proof <b>hose cabinet</b> of size 750 mm x 600mm x 300mm made of 2mm thick SS sheet with 4 mm thick glazed glass doors i/c necessary locking arrangement suitable to accommodate external hydrant with butterfly valve, 2 nos. 15 mtr. Long Hose Pipe, 1 No. branch pipe, mounted on wall or raised brick platform & duly painted with Post office red externally and White internally with Synthetic enamel paint complete in all respect, for <b>Terrace/external</b> hydrant, as required complete in all respects. | Each | 100 |          | 12,195.00 | -          | 1,219,500.00 |
|         |  |      |     |          |           | -          | -            |
| 1.15    | Supply, Installation, Testing and Commissioning <b>External Yard Hydrant Stand Post</b> comprising of GI pipe 80 mm dia (heavy duty C class) from existing ringmain to about 1 meter above ground level and Single Headed Yard Hydrant Valve with 80 mm dia flanged inlet, instantaneous gunmetal coupling of 63 mm dia with cast iron wheel ISI marked, conforming to IS : 5290 (Type A), with ABS cap and chain etc.complete with all accessroies as required.   | Each | 100 |          | 8,380.00  | -          | 838,000.00   |
|         |  |      |     |          |           | -          | -            |
| 1.16    | Providing and fixing <b>Single headed hydrants</b> flanged inlet with 63 mm female instantaneous outlet of gunmetal/SS complete with male blank caps, chains conforming to IS:5290 type A with stainless steel orifice plate (if required) to keep the pressure not more than 3.5 kg/sq.cm at any point.   | Each | 180 |          | 6,579.00  | -          | 1,184,220.00 |
|         |  |      |     |          |           | -          | -            |

| Sr. No. | Item Description   | Unit | Qty | DSR Rate  | NSR Rate  | NSR Amount | DSR Amount   |
|---------|--|------|-----|-----------|-----------|------------|--------------|
| 1       | 2  | 3    | 4   | 5         | 6         | 7          | 8            |
| 1.17    | Providing and fixing <b>Gunmetal/SS branch pipe</b> with 20mm dia nozzle conforming to IS:903. suitable for installation connections to hose coupling etc. as required.  | Each | 180 |           | 1,786.00  | -          | 321,480.00   |
| 1.18    | Providing 63mm dia 15 m long reinforced <b>Rubber lined hose pipe conforming</b> to IS: 636-1992 Part-II with gunmetal/SS male & female coupling wire wound with pipe as required.   | Each | 560 |           | 4,957.00  | -          | 2,775,920.00 |
| 1.19    | Supply, erection, testing & commissioning of <b>Exit Glow Sign Board</b> of size 200mm x 350 mm wall mounting signage consisting of photo luminescent coating, non radioactive on acrylic cover  |      |     |           |           | -          | -            |
| a)      | Single sided luminescent exit glow sign board  | Each | 150 |           | 774.00    | -          | 116,100.00   |
| b)      | Double sided luminescent exit glow sign board  | Each | 160 |           | 1,919.00  | -          | 307,040.00   |
| 1.20    | Supply, Installation, Testing and Commissioning of 100 mm dia Bourden type, Stainless Steel dial type <b>Pressure Gauge</b> including brass isolation valve and siphon pipe having caliberation of 0 - 16 Kg / cm <sup>2</sup> .   | Each | 250 |           | 1,783.00  | -          | 445,750.00   |
| 1.21    | Constructing masonry chamber 90x90x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with CI surface box with 100 mm top dia, 160 mm bottom dia, and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement: 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12mm thick, finished with a floating coat of neat cement complete as per standard design : <b>(Valve chamber coming on ground).</b> |      |     |           |           | -          | -            |
| 1.21.1  | With common burnt clay FPS (non modular) bricks of class designation 7.5   | Each | 40  | 11,842.75 |           | 473,710.00 | -            |
| 1.22    | Providing and fixing <b>C.I. sluice valves (With cap)</b> of approved quality complete with bolts, nuts, rubber insertions etc. ( the tail pieces if required will be paid separately ) Class II   |      |     |           |           | -          | -            |
| a)      | 200 mm dia   | Each | 4   | 11,316.05 |           | 45,264.20  | -            |
| b)      | 150 mm dia   | Each | 35  | 5,387.20  |           | 188,552.00 | -            |
| c)      | 100mm dia  | Each | 12  | 3,689.75  |           | 44,277.00  | -            |
| 1.23    | Providing and fixing cast iron body IS: 210 FG 200 and double flange gear simple operation type <b>Butterfly valve</b> conforming to IS: 13095 with SS304 disc and shaft NITRILE rubber replaceable seat of the following size complete with bolts, nuts, washers and rubber insertions as per specification.  |      |     |           |           | -          | -            |
| a)      | 300 mm dia(Gear operated)  | Each | 4   |           | 15,500.00 | -          | 62,000.00    |
| b)      | 250 mm dia(Gear operated)  | Each | 1   |           | 12,500.00 | -          | 12,500.00    |
| c)      | 200 mm dia   | Each | 12  |           | 9,856.00  | -          | 118,272.00   |

| Sr. No. | Item Description   | Unit | Qty | DSR Rate | NSR Rate  | NSR Amount | DSR Amount |
|---------|--|------|-----|----------|-----------|------------|------------|
| 1       | 2  | 3    | 4   | 5        | 6         | 7          | 8          |
| d)      | 150 mm dia   | Each | 62  | 5,915.00 |           | 366,730.00 | -          |
| e)      | 100 mm dia   | Each | 50  | 4686     |           | 234,300.00 | -          |
| f)      | 80 mm dia  | Each | 65  | 3303     |           | 214,695.00 | -          |
|         |  |      |     |          |           | -          | -          |
| 1.24    | Providing and fixing C.I. double flanged horizontal/vertical type <b>check valve NRV</b> including nuts, bolts, rubber insertions as required conforming to IS:5312  |      |     |          |           | -          | -          |
| a)      | 200 mm dia   | Each | 2   | 8,805.00 |           | 17,610.00  | -          |
| b)      | 150 mm dia   | Each | 27  | 5,772.00 |           | 155,844.00 | -          |
| c)      | 100 mm dia   | Each | 18  | 3,327.00 |           | 59,886.00  | -          |
| d)      | 80 mm dia  | Each | 15  | 2,392.00 |           | 35,880.00  | -          |
| e)      | 50 mm dia  | Each | 4   |          | 1,422.00  | -          | 5,688.00   |
|         |  |      |     |          |           | -          | -          |
| 1.25    | Providing and fixing of C.I. <b>'Y' type strainer</b> flanged with SS 304 perforated screen including nuts, bolts and rubber insertions etc  |      |     |          |           | -          | -          |
| a)      | 300mm dia  | Each | 4   |          | 40,274.00 | -          | 161,096.00 |
| b)      | 200mm dia  | Each | 2   |          | 14,746.00 | -          | 29,492.00  |
| c)      | 150 mm dia   | Each | 20  |          | 8,714.00  | -          | 174,280.00 |
| d)      | 100 mm dia   | Each | 15  |          | 5,275.00  | -          | 79,125.00  |
| e)      | 80 mm dia  | Each | 2   |          | 3,853.00  | -          | 7,706.00   |
|         |  |      |     |          |           | -          | -          |
| 1.26    | Providing and fixing of <b>Foot valve</b> complete with including M.S. flange nuts, bolts, washers, gaskets insertions etc.  |      |     |          |           | -          | -          |
| a)      | 100 mm dia   | Each | 2   |          | 13,500.00 | -          | 27,000.00  |
| b)      | 150 mm dia   | Each | 15  |          | 37,523.00 | -          | 562,845.00 |
| c)      | 200 mm dia   | Each | 2   |          | 41,276.00 | -          | 82,552.00  |
| d)      | 300 mm dia   | Each | 2   |          | 45,403.00 | -          | 90,806.00  |
|         |  |      |     |          |           | -          | -          |
| 1.27    | Supplying, testing, installation & commissioning of <b>Pressure switches</b> for pumps including necessary wiring upto the control panel.  | Each | 22  |          | 5,032.00  | -          | 110,704.00 |
|         |  |      |     |          |           | -          | -          |
| 1.28    | Supplying, installing, testing and commissioning <b>flow switch</b> on sprinkler distribution header on each floor and shall be connected to fire alarm panel through cable. Cable (In other's scope) shall be measured separately Flow switch shall be "UL" Listed and FM Global approved. For pressure upto 20 kg/sqcm |      |     |          |           | -          | -          |
| a)      | 150 mm dia   | Each | 85  |          | 5,591.00  | -          | 475,235.00 |
| b)      | 100 mm dia   | Each | 8   |          | 5,032.00  | -          | 40,256.00  |
| c)      | 80 mm dia  | Each | 10  |          | 4,472.00  | -          | 44,720.00  |
|         |  |      |     |          |           | -          | -          |
| 1.28a   | Supplying, installing, testing and commissioning of Inspection and testing assembly with sight glass, valves and accessories. (25 mm dia)  | Each | 42  |          | 18,196.00 | -          | 764,232.00 |
|         |  |      |     |          |           | -          | -          |



| Sr. No. | Item Description   | Unit | Qty | DSR Rate | NSR Rate  | NSR Amount | DSR Amount |
|---------|--|------|-----|----------|-----------|------------|------------|
| 1       | 2  | 3    | 4   | 5        | 6         | 7          | 8          |
| 1.28b   | Providing and fixing orifice plate made of 6 mm thick stainless steel with orifice of required size in between flange & control valve of sprinkler take off point to reduce pressure to working pressure of 3.5 kg/cm2 or as required, complete as per specifications, relevant codes and approval of the local Fire Service Department. <b>(Ground to Third floor)</b>  |      |     |          |           | -          | -          |
| a)      | 150 mm dia   | Each | 24  |          | 3,049.00  | -          | 73,176.00  |
| b)      | 100 mm dia   | Each | 4   |          | 2,541.00  | -          | 10,164.00  |
| c)      | 80 mm dia  | Each | 2   |          | 2,117.00  | -          | 4,234.00   |
|         |  |      |     |          |           | -          | -          |
| 1.29    | Providing & Fixing of SS/gun metal <b>two way fire brigade inlet</b> to riser with 63 mm dia instantaneous type inlet and 150 mm dia flanges outlet conforming to IS:904 with blank cap and chain complete with nuts, bolts, flanges and complete in all respect along with 150 mm dia butterfly valve and 150 mm dia dual plate type NRV. Cost shall include a wall mounted box of SS construction (2mm thick minimum) with glass door (4.0 mm thick) to house the above mentioned component. (Location : For Hydrant Riser, outside every block)   | Each | 12  |          | 53,958.00 | -          | 647,496.00 |
|         |  |      |     |          |           | -          | -          |
| 1.30    | Providing and fixing stainless steel <b>Four way fire brigade inlet connection to UG fire tank</b> with 4 Nos. 63 mm dia instantaneous type inlet and 150 mm dia flanges outlet conforming to IS:904 with blank cap and chain including 150 mm dia butterfly valve (PN 16 rating) complete with nuts, bolts, flanges and complete in all respect. Cost shall include a wall mounted box of SS construction 2mm thick with glass door (4.0 mm thick) of adequate size (approx 0.6 m x 0.6 m x 0.45 m) to house the above mentioned component.   | Each | 2   |          | 29,177.00 | -          | 58,354.00  |
|         |  |      |     |          |           | -          | -          |
| 1.31    | Providing and fixing stainless steel <b>four way fire brigade inlet connection to main discharge header in fire pump room</b> with 4 Nos. 63 mm dia instantaneous type inlet and 150 mm dia flanges outlet conforming to IS:904 with blank cap and chain including 150 mm dia butterfly valve (PN 16 rating) and 150 mm dia wafer type non-return valve complete with nuts, bolts, flanges and complete in all respect. Cost shall include a wall mounted box of S.S. construction 2mm thick with glass door (4.0 mm thick) of adequate size (approx 0.6 m x 0.6 m x 0.45 m) to house the above mentioned component. | Each | 2   |          | 42,689.00 | -          | 85,378.00  |
|         |  |      |     |          |           | -          | -          |
| 1.32    | Providing and fixing 150 mm dia <b>gun metal fire brigade suction hose coupling</b> of (SS draw off connection) with 150 mm dia M.S. 'C' Class suction pipe with 150 mm dia C.I. foot valve. Cost shall include a wall mounted box of SS. construction 2mm of adequate size with glass door (4.0 mm thick) to house the above mentioned component to be connected to static water tank.  | Each | 2   |          | 7,369.00  | -          | 14,738.00  |
|         |  |      |     |          |           | -          | -          |

| Sr. No. | Item Description   | Unit  | Qty   | DSR Rate | NSR Rate  | NSR Amount | DSR Amount   |
|---------|--|-------|-------|----------|-----------|------------|--------------|
| 1       | 2  | 3     | 4     | 5        | 6         | 7          | 8            |
| 1.33    | Providing and fixing Set of "Siamese" quadraplet instantaneous fire brigade connections comprising of two gunmetal instantaneous male inlet coupling 63mm dia with plug and cap, chain bends, tees etc for inlet to the static tank.   | Each  | 2     |          | 24,117.00 | -          | 48,234.00    |
| 1.34    | Providing and placing on Terrace Polyethylene Water Storage Tank ISI : 12701 MARKED indicating the BIS license No with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.  | Ltrs. | 90000 | 7.25     |           | 652,500.00 | -            |
| 1.35    | Providing, Fixing, Testing and Commissioning of Sprinkler Installation Control Valve of Cast iron body and brass / bronze working parts comprising of water motor, alarm, bronze seat clapper and clapper arm, hydraulically driven mechanical gong bell to sound continuous alarm when the Sprinkler system activates, pressure gauges, emergency releases, strainer, pressure switch, cock valve complete with drain valve and bypass, test control box, ball valves, MS pipe of required size, flanges, orifice plate, gasket etc. of size 200/150 mm dia, as required. | Each  | 12    |          | 64,543.00 | -          | 774,516.00   |
| 1.36    | Providing and fixing Sand Bucket with Stand (6 Bucket) as per site conditions  | Each  | 24    |          | 357.00    | -          | 8,568.00     |
| 1.37    | Providing & fixing of IS marked (IS:15683) portable fire extinguisher, carbondioxide type flat base including valve, discharge hose of not less than 10 mm dia. 1 M long & complete in all respects including initial fill with CO2 gas confirming to IS:15222 filled to a filling ratio of not more than 0.667 and wall suspension bracket- <b>With every FHC and one additional on every floor.</b>  |       |       |          |           | -          | -            |
| a)      | Capacity 4.5 Kg  | Each  | 274   |          | 5,741.00  | -          | 1,573,034.00 |
| 1.38    | Providing and fixing modular type ceiling mounted clean agent (FE-36) Hexaflouropropane type fire extinguisher, ISI Marked IS 15683:2006, Gas listed under EPA SNAP, having sprinkler with glass bulb rated at 68 deg.C, CE MArked Valve, suitable for Class A,B and C type of fires, conforming to ISO 14520, FM approved and UL listed.- For Electrical, UPS, Server, Battery Rooms etc.   |       |       |          |           | -          | -            |
| a)      | Capacity 10 Kg - One in each Electrical Room   | Each  | 66    |          | 4,465.00  | -          | 294,690.00   |
| 1.39    | 6 Kg. ABC MAP-90% Powder type fire extinguishers are manufactured and marked to Indian standard IS: 15683. Hose shall made of EPDM Rubber, CE Marked Valve, Suitable first aid appliance for fighting fires in Class A, B & C fire that is wood, textile, flammable liquids & gases. - <b>With every FHC and one additional on every floor + 2 in each LMR</b>   | Each  | 292   |          | 2,871.00  | -          | 838,332.00   |

| Sr. No. | Item Description  | Unit | Qty | DSR Rate | NSR Rate   | NSR Amount | DSR Amount   |
|---------|---|------|-----|----------|------------|------------|--------------|
| 1       | 2   | 3    | 4   | 5        | 6          | 7          | 8            |
| 1.40    | <b>K (Kitchen) type 6 Ltr. Stored Pressure type Fire Extinguisher</b> , with UGTS Pressure Gauge, Deep Drawn, Stainless Steel Body, EPDM Rubber Hose with SS Nozzle, CE Mark Valve with Safety Release Provision, Helium Leak Detection Tested, Controllable discharge mechanism applicable on Class K (Kitchen) Fire, maintenance, care and refilling as per IS 2190:2010  | Each | 25  |          | 15,947.00  | -          | 398,675.00   |
|         |   |      |     |          |            | -          | -            |
| 1.41    | Providing & fixing of IS marked (IS: 13386-1992) <b>Mechanical foam type</b> fire extinguishers 50 lts consisting of welded M.S. trolley mounted cylindrical body, squeeze lever discharge valve fitted with pressure discharge hose, discharge nozzle, trolley etc. finished externally with red enamel paint and fixed to wall with brackets complete with internal charges - For DG Set, Substation area   | Each | 25  |          | 9,568.00   | -          | 239,200.00   |
|         |   |      |     |          |            | -          | -            |
| 1.42    | Providing and fixing 9 liters capacity fire extinguisher <b>Water type Gas pressure</b> , fixed to wall. With EPDM Rubber Hose pipe with test certificate of helium leak detection complete to IS 15683-2006 & ISI marked   | Each | 150 |          | 1,914.00   | -          | 287,100.00   |
|         |   |      |     |          |            | -          | -            |
| 1.43    | Providing and fixing complete <b>CO2 flooding system</b> of approved make and model for main <b>LT panel</b> including two nos. 22 kg seamless cylinder required quantity of MS seamless pipe, manifold, NRV, high pressure flexible hose, weighing arrangement, pneumatic valve, CO2 nozzles including painting and MS support. The size of main LT panel will be as per Electrical scope of work. The shop drawing/datasheet of CO2 flooding system shall be provided by Agency for approval of HSCC before start of the work. The CO2 flooding panel shall also meet out the local Fire Officers latest requirement and anything extra or any modification required by Fire Officer shall be carried out by Agency without any extra cost. | Each | 15  |          | 325,115.00 | -          | 4,876,725.00 |
|         |   |      |     |          |            | -          | -            |
| 1.44    | Providing and fixing complete <b>CO2 flooding system</b> of approved make and model for main <b>HT panel</b> including two nos. 45 kg seamless cylinder required quantity of MS seamless pipe, manifold, NRV, high pressure flexible hose, weighing arrangement, pneumatic valve, CO2 nozzles including painting and MS support. The size of main HT panel will be as per Electrical scope of work. The shop drawing/datasheet of CO2 flooding system shall be provided by Agency for approval of HSCC before start of the work. The CO2 flooding panel shall also meet out the local Fire Officers latest requirement and anything extra or any modification required by Fire Officer shall be carried out by Agency without any extra cost. | Each | 4   |          | 171,318.00 | -          | 685,272.00   |
|         |   |      |     |          |            | -          | -            |
| 1.45    | Suppression System  |      |     |          |            | -          | -            |

| Sr. No. | Item Description  | Unit | Qty      | DSR Rate | NSR Rate   | NSR Amount | DSR Amount   |
|---------|---|------|----------|----------|------------|------------|--------------|
| 1       | 2   | 3    | 4        | 5        | 6          | 7          | 8            |
|         | S/F 10 LB capacity NOVEC 1230 DLP Assembly with Automatic valve, push in connector for tube, 5 LB NOVEC 1230 gas, mounting bracket, end of line adopter and low pressure switch for monitoring system activation of automatic linear pneumatic tube detection system complete etc. as reqd as one job make: Fire Trex /Seimens / UTC                    | JOB  | 15       |          | 144,548.00 | -          | 2,168,220.00 |
|         |   |      |          |          |            | -          | -            |
|         | S/F 2.5 LB capacity NOVEC 1230 DLP Assembly with Automatic valve, push in connector for tube, 2.5 LB NOVEC 1230 gas, mounting bracket, end of line adopter and low pressure switch for monitoring system activation of automatic linear pneumatic tube detection system, complete etc. as reqd as one job make: Fire Trex /Seimens / UTC                | JOB  | 25.00    |          | 75,555.00  | -          | 1,888,875.00 |
|         | S/F linear pneumatic heat detection tube UL marked and suppression system operated on 92-100 deg, Cent temp. With all necessary fittings and supports, fixing in the existing electrical panel board, complete etc as required at site . Make: FireTrex/Srevo System/Fire System/Fire TEC   | MTR  | 1,500.00 |          | 1,768.00   | -          | 2,652,000.00 |
|         | S/F audio visual alarm system for automatic linear fire trace tube detection system, complete etc as required at site   | Each | 40.00    |          | 2,860.00   | -          | 114,400.00   |
|         |   |      |          |          |            | -          | -            |
|         |   |      |          |          |            | -          | -            |
| 1.46    | <b>Supplying, Installation, Testing &amp; Commissioning modular construction master control annuciation panel</b> for sprinkler with provision for required No. of Zone (30% additional spares),each sprinkler hydrant will have atleast 4 zone on each floor as approved by engineer.The panel shall have but not limited to the following arrangment. |      |          |          |            | -          | -            |
|         | a) Indication of Zone sprinkler   |      |          |          |            | -          | -            |
|         | b) Indication of zone fault   |      |          |          |            | -          | -            |
|         | c) Fire/fault hooter  |      |          |          |            | -          | -            |
|         | d) Alarm cancel for fire/fault  |      |          |          |            | -          | -            |
|         | e) Battery for emergency back up of 4 Hrs.  | Set  | 40       |          | 102,064.00 | -          | 4,082,560.00 |
|         |   |      |          |          |            | -          | -            |
| 1.47    | Providing and fixing <b>SS flexible sprinkler drop unbraided 20 mm NB</b> UL listed having a working pressure of 12 kg/sq.cm complete with GI nipple, sprinkler fixing adaptor and fixing clamps complete as per Manufacturer's catalogue and decorative 65 mm dia CP brass/SS flange for fixing sprinkler below false ceiling                          |      |          |          |            | -          | -            |
|         | a) 20mm NBx700 mm long  | Each | 1200     |          | 765.00     | -          | 918,000.00   |
|         | b) 20mm NBx1000 mm long   | Each | 2300     |          | 893.00     | -          | 2,053,900.00 |
|         | c) 20mm NBx1200 mm long   | Each | 2141     |          | 1,084.00   | -          | 2,320,844.00 |
|         | d) 20mm NBx1500 mm long   | Each | 650      |          | 1,212.00   | -          | 787,800.00   |
|         |   |      |          |          |            | -          | -            |
| 1.48    | Providing and Fixing 15 mm dia gunmetal / brass quartzoid type <b>Sprinkler Head</b> with quartz bulb and set to operate at specified temperature.  |      |          |          |            | -          | -            |
|         | a) Pendent / Upright type, 68 C, Chrome plated With cp cover  | Each | 20402    |          | 316.00     | -          | 6,447,032.00 |
|         |   |      |          |          |            | -          | -            |

| Sr. No. | Item Description  | Unit | Qty  | DSR Rate | NSR Rate  | NSR Amount | DSR Amount |
|---------|---|------|------|----------|-----------|------------|------------|
| 1       | 2   | 3    | 4    | 5        | 6         | 7          | 8          |
| b)      | Side wall extended throw 20 mm dia 68 C, Chrome plated  | Each | 1250 |          | 597.00    | -          | 746,250.00 |
| 1.49    | Providing and fixing of 150mm dia <b>deluge valve</b> of cast iron body and brass/bronze working parts comprising of water motor, alarm, bronze seat clapper and clapper alarm, pressure gauges, emergency releases, pressure switch cock valve complete with drain valve, ball valve, flanges, gasket etc.   | Each | 8    |          | 32,769.00 | -          | 262,152.00 |
| 1.50    | Providing and fixing heavy duty floating flange <b>EPDM rubber expansion joint</b> with unit control(tie rod & gusset plate) as per manufactures specifications of standard length complete with all accessories and a working pressure not less than 16 kg/sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.   |      |      |          |           | -          | -          |
| a)      | 50 mm dia   | No.  | 4    |          | 4,852.00  | -          | 19,408.00  |
| b)      | 65 mm dia   | No.  | 4    |          | 5,363.00  | -          | 21,452.00  |
| c)      | 100 mm dia  | No.  | 8    |          | 7,023.00  | -          | 56,184.00  |
| d)      | 150 mm dia  | No.  | 30   |          | 8,810.00  | -          | 264,300.00 |
| e)      | 200mm dia   | No.  | 12   |          | 11,747.00 | -          | 140,964.00 |
| 1.51    | Providing & fixing <b>Puddle Flanged</b> including 60 to 90 cm long GI pipe piece welded / threaded with MS plates 450x450x6mm thick with both end screwed / flanged  |      |      |          |           | -          | -          |
| a)      | For 50 mm dia pipe  | Each | 14   |          | 1,446.00  | -          | 20,244.00  |
| b)      | For 100 mm dia pipe   | Each | 10   |          | 1,990.00  | -          | 19,900.00  |
| c)      | For 80 mm dia pipe  | Each | 4    |          | 1,631.00  | -          | 6,524.00   |
| d)      | for 150 mm dia pipe   | Each | 18   |          | 2,409.00  | -          | 43,362.00  |
| e)      | for 200 mm dia pipe   | Each | 4    |          | 3,074.00  | -          | 12,296.00  |
| f)      | for 300 mm dia pipe   | Each | 4    |          | 3,945.00  | -          | 15,780.00  |
| 1.52    | <b>Supplying, installing, testing and commissioning of Electric Driven Fire Pump</b> suitable for automatic operation consisting of the following (as per CPWD specification Part V-1985 for Fire Fighting and its amendments) (For Hydrant system & Sprinkler system).   |      |      |          |           | -          | -          |
| a)      | Fire pump <b>(A) Factory Assembled (factory fitted)</b> with stainless steel impeller, CI casing, SS shaft & mechanical seal shall be horizontal split casing centrifugal suction type multistage having following capacity and head so as to ensure a minimum pressure of 3.0 kg per square cm. at the highest and farthest out let at the specified flow complete with necessary strainer / foot valve suction side and pressure gauge on the delivery side including by pass arrangement for periodical testing of the working of the pumping set as required. The pump shall be provided with mechanical seals. <b>(B) The Pump Set shall be Inspected at factory before dispatched and tested as design head the testing &amp; inspected charges will bound by agency)</b> |      |      |          |           | -          | -          |

| Sr. No. | Item Description  | Unit | Qty | DSR Rate | NSR Rate   | NSR Amount | DSR Amount   |
|---------|---|------|-----|----------|------------|------------|--------------|
| 1       | 2   | 3    | 4   | 5        | 6          | 7          | 8            |
| b)      | Squirrel cage type TEFC motor suitable for operation on 415V, 10%, 3 phases 50 Hz. system of suitable 85 HP for the above pump with synchronous speed of 1500 RPM and flexible coupling. The pump motor should conform to IS: 325-1978.   |      |     |          |            | -          | -            |
| c)      | Common bed plate fabricated from mild steel channel or cast iron type.  |      |     |          |            | -          | -            |
| d)      | Suitable cement concrete pump foundation & vibration damping arrangement with cushy foot mounting as required.  |      |     |          |            | -          | -            |
| (e)     | Capacity 2850 LPM and Head 90 Metres  | Each | 4   |          | 821,760.00 | -          | 3,287,040.00 |
| 1.53    | <b>Supplying, installing, testing and commissioning of Diesel Engine Driven Fire Pump</b> suitable for automatic operation consisting of the following (as per CPWD specifications PartV 1985.) (For Hydrant system & Sprinkler system).  |      |     |          |            | -          | -            |
| a)      | Horizontal centrifugal type multi-stage, fire pump <b>(A) Factory Assembled (factory fitted)</b> with stainless steel impeller CI casing, SS shaft & mechanical seal complete of following capacity and Head so as to ensure a minimum pressure of 3.0 kg per sq.cm. at the highest & farthest outlet at the specified flow, complete with necessary strainer pressure gauge on the delivery side etc. including by pass arrangement for periodical testing of the working of the pump set as required. The pump shall be provided with mechanical seals. <b>(B) The Pump Set shall be Inspected at factory before dispatched and tested as design head the testing &amp; inspected charges will bound by agency)</b> |      |     |          |            | -          | -            |
| b)      | Water cooled cold starting type multi cylinder 4 stroke diesel engine, developing suitable 85 HP at 1500 RPM for the above pump set with automatic starting mechanism, cooling system shall be with radial cool engine, maintenance free batteries, battery charge unit, flexible coupling with the pump, common bed plate for mounting diesel engine fuel day tank fuel piping and pump and vibration damping arrangement by cushy foot mounting as required complete in all respects.   |      |     |          |            | -          | -            |
| c)      | The engine shall be capable to drive the pump at 150% rated discharge at 65% head and shall be suitable for 10% overload capacity for one hour in any period of 12 hrs. continuous run.   |      |     |          |            | -          | -            |
| d)      | Common bed plate fabricated from mild steel channel or cast iron type.  |      |     |          |            | -          | -            |
| e)      | Isolation Valve   |      |     |          |            | -          | -            |
| f)      | Suitable cement concrete pump foundation & vibration damping arrangement with cushy foot mounting as required.  |      |     |          |            | -          | -            |

| Sr. No. | Item Description  | Unit | Qty | DSR Rate | NSR Rate     | NSR Amount | DSR Amount   |
|---------|---|------|-----|----------|--------------|------------|--------------|
| 1       | 2   | 3    | 4   | 5        | 6            | 7          | 8            |
|         |   |      |     |          |              | -          | -            |
| (g)     | Capacity 2850 LPM and Head <b>90 Metres</b>   | Each | 2   |          | 1,436,744.00 | -          | 2,873,488.00 |
|         |   |      |     |          |              | -          | -            |
| 1.54    | Supplying, installation, testing and periodic commissioning of <b>Electric Motor Driven Automatic Pressurization Pump</b> set consisting of the following (as per specification) (For Hydrant system & Sprinkler system).   |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| a)      | Centrifugal pump of specified capacity capable of building up pressure lost in any leakage in the system against a total head (mentioned as under) complete with C.I. casing stainless steel impeller ; mechanical seal & S.S. shaft necessary strainer, pressure gauge on delivery side etc. including by-pass arrangement for testing of the working of the pumping set as required .   |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| b)      | Squirrel cage A.C. induction motor suitable for operation on 415 V, 10% 3 phase 50 Hz. A.C. supply and of minimum 12.5 HP,2900 RPM, for the above pump with flexible coupling as per specification and conforming to IS: 325/ 1978 and shall be TEFC type only.   |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| c)      | Common bed plate fabricated from mild steel channel or cast iron type.  |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| d)      | Suitable cement concrete pump foundation with vibration damping arrangement with cushy foot or similar mounting as per required.  |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| (i)     | 180 LPM & Head - <b>90 Metres (including the cost of panel)</b>   | Each | 4   |          | 148,124.00   | -          | 592,496.00   |
|         |   |      |     |          |              | -          | -            |
| 1.55    | <b>Supplying, installing, testing and commissioning of Electric Motor Driven type Automatic Pressurisation, Pump set</b> suitable for automatic operation of <b>Terrace down comer</b> and consisting of the following (as per CPWD specifications Part V-1985) for fire fighting and its amendments).  |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| a       | Fire pump with stainless steel impeller CI casing, SS shaft shall be horizontal end suction centrifugally type having a capacity of <b>900 LPM</b> against a total head of <b>35m</b> so as to ensure a minimum pressure of 3.0 kg/sqm at the highest and farthest out at the specified flow complete with necessary strainer with foot valve in suction side and pressure gauge on the delivery side including bypass arrangement for periodic testing of the working of the pumping set as required. The pump shall be provided with mechanical seals.(Including taking necessary approval of complete fire fighting scheme from local fire authority before and after start of work) {Agency also has to submit characteristic curve of the pumps, model & other technical data for approval before placing the order} |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| b       | Squirrel cage AC induction motor suitable for operation of 415 V ,+/-10%, 3 phase 50 HZ, AC supply and of minimum <b>10 HP</b> ,1500 RPM for the above pump with flexible coupling as per specification and conforming to IS 325-1978 and shall be TEFC type only   |      |     |          |              | -          | -            |
|         |   |      |     |          |              | -          | -            |
| c       | Common base plate fabricated from mild steel channel or cast iron type  |      |     |          |              | -          | -            |

| Sr. No. | Item Description   | Unit | Qty | DSR Rate | NSR Rate   | NSR Amount | DSR Amount   |
|---------|--|------|-----|----------|------------|------------|--------------|
| 1       | 2  | 3    | 4   | 5        | 6          | 7          | 8            |
| d       | 1 No. 3 Phase, fully automatic DOL starter, type - II of 10 HP with thermal overload relay, contactor, Timer, Push Buttons and Auto-manual selector switch etc complete as required.   |      |     |          |            | -          | -            |
| e       | Suitable cement concrete pump foundation with vibration damping arrangement with cushy foot mounting as required and having provision of suitable weather protection cover.  | Each | 2   |          | 653,487.00 | -          | 1,306,974.00 |
|         |  |      |     |          |            | -          | -            |
| 1.56    | Supplying, installing, testing and commissioning of <b>electric motor driven type automatic pressurisation, pump set</b> suitable for automatic operation of <b>terrace down comer</b> and consisting of the following (as per CPWD specifications Part V-1985) for fire fighting and its amendmndts).   |      |     |          |            | -          | -            |
| a       | Fire pump with stainless steel impeller CI casing, SS shaft shall be horizontal end suction centrifugally type having a capacity of <b>450 LPM</b> against a total head of <b>25m</b> so as to ensure a minimum pressure of 3.0 kg/sqm at the highest and farthest out at the specified flow complete with necessary strainer with foot valve in suction side and pressure gauge on the delivery side including bypass arrangement for periodic testing of the working of the pumping set as required. The pump shall be provided with mechanical seals.(Including taking necessary approval of complete fire fighting scheme from local fire authority before and after start of work) {Agency also has to submit characterstic curve of the pumps, model & other technical data for approval before placing the order} |      |     |          |            | -          | -            |
| b       | Squirrel cage AC induction motor suitable fot operation of 415 V ,+/-10%, 3 phase 50 HZ, AC supply and of minimum 7.5 HP,1500 RPM for the above pump with flexible coupling as per spwcification and conforming to IS 325-1978 and shall be TEFC type only   |      |     |          |            | -          | -            |
| c       | Common base plate fabricated from mild steel channel ot castiron type  |      |     |          |            | -          | -            |
| d       | 1 No. 3 Phase, fully automatic DOL starter, type - II of 10 HP with thermal overload relay, contactor, Timer, Push Buttons and Auto-manual selector switch etc complete as required.   |      |     |          |            | -          | -            |
| e       | Suitable cement concrete pump foundation with vibration damping arrangement with cushy foot mounting as required and having provision of suitable weather protection cover.  | Each | 12  |          | 556,419.00 | -          | 6,677,028.00 |
|         |  |      |     |          |            | -          | -            |
| 1.57    | Providing and fixing exhaust, Diesel engine driven pump <b>exhaust M. S. pipe</b> class 'B' of suitable dia (100mm dia) for the engine including fitting like flanges, bends, reducers, etc. The pipe shall be provided with 12 mm thick supercera ceramic fibre rope, 21 gauge, necessary excavation, fixing of silencer connections at engine exhaust, necessary supports, back filling, cutting and making good, bird proof and weather proof flap complete in all respect as directed.   | RM   | 300 |          | 1,443.00   | -          | 432,900.00   |
|         |  |      |     |          |            | -          | -            |
|         | FIRE -FIGHTING PANEL (In Pump Room)  |      |     |          |            | -          | -            |
|         |  |      |     |          |            | -          | -            |



| Sr. No. | Item Description  | Unit | Qty | DSR Rate | NSR Rate | NSR Amount | DSR Amount |
|---------|---|------|-----|----------|----------|------------|------------|
| 1       | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
| 1.58    | <b>FIRE PUMP PANEL</b>  |      |     |          |          | -          | -          |
|         | Supply, installation, testing and commissioning of following M.V. cubicle type totally enclosed, powder coated, free standing type, dust, damp and vermin proof, indoor type Panel complete with busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, and having following incoming and outgoing switchgears complete as required. |      |     |          |          | -          | -          |
|         | Note :  |      |     |          |          | -          | -          |
|         | <b>All MCCBs shall have Ics=Icu .</b>   |      |     |          |          | -          | -          |
|         | <b>INCOMER :</b>  |      |     |          |          | -          | -          |
|         | <b>1000 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C &amp; inbuilt E/F protection release.</b>   |      |     |          |          | -          | -          |
|         | Phase indicating lamp (LED type) with 6A control SP MCB   |      |     |          |          | -          | -          |
|         | "ON" ,"OFF" and "TRIP" LED indicating lamp and 6A control SP MCBs   |      |     |          |          | -          | -          |
|         | Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.  |      |     |          |          | -          | -          |
|         | 1 No. 0 to 500 V Digital voltmeter.   |      |     |          |          | -          | -          |
|         | Digital ammeter with one set Suitable C.Ts.   |      |     |          |          | -          | -          |
|         | <b>BUSBARS :</b>  |      |     |          |          | -          | -          |
|         | <b>1000 Amp TPN busbars of copper</b>   |      |     |          |          | -          | -          |
|         | <b>OUTGOINGS :</b>  |      |     |          |          | -          | -          |
|         | <b>i</b> 5 Sets of following (Terrace Pump) (1w+1s) 10 Outgoings  |      |     |          |          | -          | -          |
|         | <b>Suitable rated 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.</b>   |      |     |          |          | -          | -          |
|         | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          | -          | -          |
|         | 1 no 3 Phase,DOL starter of 5 HP with thermal overload relay with inbuilt single phase preventor , contactor, Push Buttons and Switches etc complete as required.   |      |     |          |          | -          | -          |
|         | LED indicating Lamps for "ON" ,"OFF" & "TRIP" .   |      |     |          |          | -          | -          |
|         | 1 no Digital ammeter with one set of suitable C.T. s  |      |     |          |          | -          | -          |
|         | <b>ii</b> 1 Sets of following (Terrace Pump) (1w+1s) 2 Outgoings  |      |     |          |          | -          | -          |

| Sr. No. | Item Description  | Unit | Qty | DSR Rate | NSR Rate | NSR Amount | DSR Amount |
|---------|---|------|-----|----------|----------|------------|------------|
| 1       | 2   | 3    | 4   | 5        | 6        | 7          | 8          |
|         | <b>Suitable rated 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.</b>   |      |     |          |          | -          | -          |
|         | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          | -          | -          |
|         | 1 no 3 Phase,DOL starter of 10 HP with thermal overload relay with inbuilt single phase preventor , contactor, Push Buttons and Switches etc complete as required.  |      |     |          |          | -          | -          |
|         | LED indicating Lamps for "ON" , "OFF" & "TRIP" .  |      |     |          |          | -          | -          |
|         | 1 no Digital ammeter with one set of suitable C.T. s  |      |     |          |          | -          | -          |
|         |   |      |     |          |          | -          | -          |
| iii     | 4 Sets of following( main electric Driven pump ) 4 Outgoings  |      |     |          |          | -          | -          |
|         | <b>Suitable rated 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.</b>  |      |     |          |          | -          | -          |
|         | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          | -          | -          |
|         | 1 NOs. 3 Phase, VFD starter of 125 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required. |      |     |          |          | -          | -          |
|         | LED indicating Lamps for "ON" , "OFF" & "TRIP" .  |      |     |          |          | -          | -          |
|         | 1 no Digital ammeter with one set of suitable C.T. s  |      |     |          |          | -          | -          |
|         |   |      |     |          |          | -          | -          |
| vi      | 4 Sets of following ( Jockey) 4 Outgoings   |      |     |          |          | -          | -          |
|         | <b>Suitable rated 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings. of O/L, S/C protection and E/ F Module.</b>   |      |     |          |          | -          | -          |
|         | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.   |      |     |          |          | -          | -          |
|         | 1 NOs. 3 Phase, DOL of 10 HP with thermal overload relay with inbuilt/separate single phase preventer , contactor, Timer, Push Buttons and Auto-manual selector switch etc including its mounting on the wall and control cables for starting of the motor complete as required.          |      |     |          |          | -          | -          |
|         | LED indicating Lamps for "ON" , "OFF" & "TRIP".   |      |     |          |          | -          | -          |
|         | Digital ammeter with one set of suitable cast resin C.T' s  |      |     |          |          | -          | -          |
|         |   |      |     |          |          | -          | -          |
| v       | 4 Sets of following (Spare)   |      |     |          |          | -          | -          |
|         | <b>Suitable rated 415 volts, 35 KA (Ics=Icu), TPN MPCB, with Thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.</b>  |      |     |          |          | -          | -          |

| Sr. No. | Item Description   | Unit | Qty | DSR Rate | NSR Rate     | NSR Amount            | DSR Amount     |
|---------|--|------|-----|----------|--------------|-----------------------|----------------|
| 1       | 2  | 3    | 4   | 5        | 6            | 7                     | 8              |
|         | Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.  |      |     |          |              | -                     | -              |
|         | LED indicating Lamps for "ON" , "OFF" & "TRIP" .   |      |     |          |              | -                     | -              |
|         |  |      |     |          |              | -                     | -              |
| vi      | 2 Set of following in a separate cubicle (Diesel engine auto starting kit)   |      |     |          |              | -                     | -              |
|         | <b>One no. Diesel engine auto starting kit with all necessary relay, controls, wiring etc to start 45 HP diesel engine when electrical driven fire pump fail to start including one no rectifier circuit, battery charger, batteries, DC Voltmeter, DC Ammeter and its interconnection with control cables etc complete in ready to use condition.</b> |      |     |          |              | -                     | -              |
|         |  |      |     |          |              | -                     | -              |
|         | Fire Fighting Pump Panel Hospital Block in Pump room as above  | Set  | 1   |          | 1,415,100.00 | -                     | 1,415,100.00   |
|         |  |      |     |          |              | -                     | -              |
|         | Grand Total  |      |     |          |              | 32,682,979.47         | 109,385,522.26 |
|         |  |      |     |          |              | <b>142,068,501.74</b> |                |

**Name of Work : Construction of Hoospital & Academic Campus at All India Institute of Medical Sciences  
Campus (AIIMS) at Guntur, A. P.**

**MAIN ABSTRACT SHEET**

| <b>A ELECTRICAL WORKS</b> |  |                       |                       |
|---------------------------|--|-----------------------|-----------------------|
| <b>SI. No.</b>            | <b>SUB HEADS</b>   | <b>DSR AMOUNT</b>     | <b>NSR AMOUNT</b>     |
| 1                         | DISTRIBUTION BOARDS AND PANELS   | -                     | 39,959,248.00         |
| 2                         | MV CABLES, CABLE JOINTING & END TERMINATIONS                               | 3,106,516.00          | 26,970,288.00         |
| 3                         | RISING MAINS & BUS DUCT - OUTDOOR (IN AIR - OVER HEAD, OUTDOOR TYPE) IP 66 | -                     | 24,582,040.00         |
| 4                         | CABLE TRAYS  | 10,132,057.00         | 4,222,820.00          |
| 5                         | MCCB, MCB & DB'S   | 8,345,974.00          | 2,013,912.00          |
| 6                         | POINT WIRING   | 90,691,552.20         | 15,580,462.00         |
| 7                         | UPS  | -                     | 10,766,181.00         |
| 8                         | LIGHT FIXTURES AND FANS  | -                     | 61,567,320.00         |
| 9                         | LIGHTING CONTROLS  | -                     | 26,012,837.00         |
| 10                        | EARTHING   | 1,696,206.00          | 3,838,672.00          |
| 11                        | NURSE CALL SYSTEM  | 3,564,750.00          | 25,065,815.00         |
| 12                        | LIGHTNING PROTECTION SYSTEM AS PER IS/IEC-62305                            | -                     | 3,523,389.00          |
| 13                        | SAFETY EQUIPMENTS  | 9,946.00              | 3,945,098.00          |
| 14                        | MISC. WORKS  | 101,750.00            | -                     |
| 15                        | FIRE DETECTION AND ALARM SYSTEM - ANALOG ADDRESSABLE SYSTEM                | 9,635,997.00          | 62,123,416.00         |
| 16                        | IP CCTV SURVEILLANCE SYSTEMS   | 2,128,790.00          | 43,631,568.00         |
| 17                        | ELEVATORS  | -                     | 139,062,610.00        |
| 18                        | AVIATION OBSTRUCTION LIGHT   | -                     | 378,180.00            |
| 19                        | ACCESS CONTROL SYSTEM  | 176,400.00            | 1,644,392.00          |
| 20                        | AV SYSTEM  |                       | 45,500,000.00         |
|                           | <b>TOTAL</b>   | <b>129,589,938.00</b> | <b>540,388,248.00</b> |
|                           |  |                       |                       |
|                           | <b>TOTAL</b>   | <b>669,978,186.00</b> |                       |

**ABSTRACT OF COST FOR ELECTRICAL WORKS**

Name of Work : Construction of Hoapital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at Guntur, A. P.

| S. No         | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1             | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 1.0           | MR      | <b>DISTRIBUTION BOARDS AND PANELS</b>   |     |      |          |          |                  |                  |
|               |         | Design, manufacture, assembly, wiring, testing at works and supply to site, installation, testing of following panels/ distribution boards/ switch boards. The boards shall be designed and fabricated as per general specifications, technical details, specifications and notes as part of this tender/ BOQ and relevant BIS codes. |     |      |          |          |                  |                  |
|               |         | Also, refer to General Notes and Specifications for Panels/ Boards  |     |      |          |          |                  |                  |
|               |         | <b>GENERAL NOTES FOR MCCB's:</b>  |     |      |          |          |                  |                  |
| a.            |         | MCCB's shall be of 3P or 4P as called for in the BOQ.   |     |      |          |          |                  |                  |
| b.            |         | Ics = Icu =Icw 100% for the ACB   |     |      |          |          |                  |                  |
| c.            |         | Ics = Icu 100% for the MCCB   |     |      |          |          |                  |                  |
| d.            |         | If nothing is specified in the BOQ, MCCB's upto 250A shall be only with magnetic release for motor duty and shall be with thermal magnetic release upto 250A for non motor duty and above 250A shall be with microprocessor based releases with Earth fault protection- motor duty/ non motor duty as the case may be.                |     |      |          |          |                  |                  |
| e.            |         | MCCB's shall be with extended rotary handle.  |     |      |          |          |                  |                  |
| f.            |         | For UPS output panels, MCCB's shall be of 3Pole with 2N, neutral links (twice rated neutral link).  |     |      |          |          |                  |                  |
| g.            |         | Exact rating (Amps), Poles, Type/ Duty, Short circuit rating of MCCB is to be selected by the contractor as per load, fault and requirement and also approval taken.  |     |      |          |          |                  |                  |
|               |         | <b>GENERAL NOTES FOR TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS):</b>   |     |      |          |          |                  |                  |
| a.            |         | Transient Voltage Surge Suppressors (TVSS) shall be mounted out side the panel/ switch board in a sheet steel enclosure.  |     |      |          |          |                  |                  |
| b.            |         | It shall be suitable for handling required (specified) surge handling capacity, shall be 10 modes protection with noise filters. (EMI & RFI) and with inbuilt back up fuse protection.  |     |      |          |          |                  |                  |
| c.            |         | Surge suppressor shall be complete with isolating/ protective device in the form of MCB/ MCCB of KA rating (breaking capacity) as of switch board.  |     |      |          |          |                  |                  |
| <b>Notes:</b> |         |   |     |      |          |          |                  |                  |
| 1.0           |         | All Switchgear selections shall be as per manufacturer's recommendation.  |     |      |          |          |                  |                  |
| 2.0           |         | Contractor to submit manufacturer's selection charts for approval.  |     |      |          |          |                  |                  |
| 3.0           |         | Only one make of switchgear to be used in a board/ panel.   |     |      |          |          |                  |                  |
| 1.1           | MR      | <b>MAIN BUILDING LT PANEL (IPD) TTA PANEL</b>   |     |      |          |          |                  |                  |
|               |         | <b>Section-1</b>  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer:</b>   |     |      |          |          |                  |                  |
|       |         | 1 No., 3200 A, 50 kA, 4P, MDO, ACB with:  |     |      |          |          |                  |                  |
|       | i.      | 230V, AC spring charging motor  |     |      |          |          |                  |                  |
|       | ii.     | 230V, AC closing coil   |     |      |          |          |                  |                  |
|       | iii.    | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
|       | iv.     | 4 NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
|       | v.      | In built trip LED's   |     |      |          |          |                  |                  |
|       | vi.     | Breaker control switch  |     |      |          |          |                  |                  |
|       |         | <b>Protection:</b>  |     |      |          |          |                  |                  |
|       | i.      | In built micro processor based releases (O/C, S/C & E/F).   |     |      |          |          |                  |                  |
|       | ii.     | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)   |     |      |          |          |                  |                  |
|       |         | <b>Metering &amp; Indications</b>   |     |      |          |          |                  |                  |
|       | i.      | R, Y, B LED indications (110V)  |     |      |          |          |                  |                  |
|       | ii.     | ON, OFF, TRIP LED indications (24V DC)  |     |      |          |          |                  |                  |
|       | iii.    | Trip circuit healthy indications (24V DC)   |     |      |          |          |                  |                  |
|       | iv.     | 415V/ $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|       | v.      | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.   |     |      |          |          |                  |                  |
|       | vi.     | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).   |     |      |          |          |                  |                  |
|       | vii.    |   |     |      |          |          |                  |                  |
|       |         | <b>Bus Bars:</b>  |     |      |          |          |                  |                  |
|       |         | 4000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|       |         | <b>Out goings:</b>  |     |      |          |          |                  |                  |
|       |         | 2 Nos.2500 A 50 kA, 4P MDO ACB with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | For Each :  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:   |     |      |          |          |                  |                  |
|       |         | A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 2 Nos. 2000 A 50 KA, 4P MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/ OFF LED indications (24V DC). |     |      |          |          |                  |                  |
|       |         | For Each :  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:   |     |      |          |          |                  |                  |
|       |         | A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 3 Nos. 630 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 4 Nos. 250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 2 Nos. 200 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 2 No. 125 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |          |                  |                  |
|       |         | <b>Bus Coupler - 1:</b>   |     |      |          |          |                  |                  |
|       |         | <b>Between Section 1 &amp; 2:</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 3200A, 50KA, 4P, EDO ACB with:  |     |      |          |          |                  |                  |
|       | i.      | 230V AC spring charging motor   |     |      |          |          |                  |                  |
|       | ii.     | 230V AC closing coil  |     |      |          |          |                  |                  |
|       | iii.    | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
|       | iv.     | 4NO + 4NC Aux. contacts   |     |      |          |          |                  |                  |
|       |         | <b>Indications</b>  |     |      |          |          |                  |                  |
|       |         | ON, OFF LED indications (24V DC)  |     |      |          |          |                  |                  |
|       |         | <b>Section-2</b>  |     |      |          |          |                  |                  |
|       |         | <b>Incomer:</b>   |     |      |          |          |                  |                  |
|       |         | 1 No., 3200 A, 50 kA, 4P, MDO, ACB with:  |     |      |          |          |                  |                  |
|       | i.      | 230V, AC spring charging motor  |     |      |          |          |                  |                  |
|       | ii.     | 230V, AC closing coil   |     |      |          |          |                  |                  |
|       | iii.    | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
|       | iv.     | 4 NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
|       | v.      | In built trip LED's   |     |      |          |          |                  |                  |
|       | vi.     | Breaker control switch  |     |      |          |          |                  |                  |
|       |         | <b>Protection:</b>  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| i.    |         | In built micro processor based releases (O/C, S/C & E/F).   |     |      |          |          |                  |                  |
| ii.   |         | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)   |     |      |          |          |                  |                  |
|       |         | <b>Metering &amp; Indications</b>   |     |      |          |          |                  |                  |
| i.    |         | R, Y, B LED indications (110V)  |     |      |          |          |                  |                  |
| ii.   |         | ON, OFF, TRIP LED indications (24V DC)  |     |      |          |          |                  |                  |
| iii.  |         | Trip circuit healthy indications (24V DC)   |     |      |          |          |                  |                  |
| iv.   |         | 415V/ $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.    |         | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.   |     |      |          |          |                  |                  |
| vi.   |         | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).   |     |      |          |          |                  |                  |
| vii.  |         |   |     |      |          |          |                  |                  |
|       |         | <b>Bus Bars:</b>  |     |      |          |          |                  |                  |
|       |         | 4000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|       |         | <b>Out goings:</b>  |     |      |          |          |                  |                  |
|       |         | 2 Nos.2500 A 50 kA, 4P MDO ACB with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | For Each :  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:   |     |      |          |          |                  |                  |
|       |         | A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 2 Nos.2000 A 50 kA, 4P MDO ACB with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | For Each :  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:   |     |      |          |          |                  |                  |
|       |         | A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |



| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 3 No. 250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 2 No. 125 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | <b>Bus Coupler - 2:</b>  |     |      |          |          |                  |                  |
|       |         | <b>Between Section 2 &amp; 3:</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 3200A, 50KA, 4P, EDO ACB with:   |     |      |          |          |                  |                  |
| i.    |         | 230V AC spring charging motor  |     |      |          |          |                  |                  |
| ii.   |         | 230V AC closing coil   |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.   |         | 4NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
|       |         | <b>Indications</b>   |     |      |          |          |                  |                  |
|       |         | ON, OFF LED indications (24V DC)   |     |      |          |          |                  |                  |
|       |         | <b>Section-3</b>   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 2000 A 50KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|       |         | 415V/ $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|       |         | 1250 A, 4P, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|       |         | 2 Nos. 1250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |

| S. No      | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|------------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1          | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
|            |           | 4 Nos. 800 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|            |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |           |                  |                  |
|            |           | MAIN BUILDING LT PANEL (IPD) TTA PANEL   | 1   | Set  |          | 7,377,451 |                  | 7,377,451        |
| <b>1.2</b> | <b>MR</b> | <b>LT PANEL-3 (ACADEMIC) TTA PANEL</b>   |     |      |          |           |                  |                  |
|            |           | IP Rating : IP 42  |     |      |          |           |                  |                  |
|            |           | <b>Incomer:</b>  |     |      |          |           |                  |                  |
|            |           | 1 No., 2000 A, 50 kA, 4P, MDO, ACB with:   |     |      |          |           |                  |                  |
| i.         |           | 230V, AC spring charging motor   |     |      |          |           |                  |                  |
| ii.        |           | 230V, AC closing coil  |     |      |          |           |                  |                  |
| iii.       |           | 24V, DC shunt trip coil  |     |      |          |           |                  |                  |
| iv.        |           | 4 NO + 4NC Aux. contacts   |     |      |          |           |                  |                  |
| v.         |           | In built trip LED's  |     |      |          |           |                  |                  |
| vi.        |           | Breaker control switch   |     |      |          |           |                  |                  |
|            |           | <b>Protection:</b>   |     |      |          |           |                  |                  |
| i.         |           | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |           |                  |                  |
| ii.        |           | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |           |                  |                  |
|            |           | <b>Metering &amp; Indications</b>  |     |      |          |           |                  |                  |
| i.         |           | R, Y, B LED indications (110V)   |     |      |          |           |                  |                  |
| ii.        |           | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |           |                  |                  |
| iii.       |           | Trip circuit healthy indications (24V DC)  |     |      |          |           |                  |                  |
| iv.        |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |           |                  |                  |
| v.         |           | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |           |                  |                  |
| vi.        |           | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |           |                  |                  |
| vii.       |           | .  |     |      |          |           |                  |                  |
|            |           | <b>Bus Bars:</b>   |     |      |          |           |                  |                  |
|            |           | 2500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)   |     |      |          |           |                  |                  |
|            |           | <b>Out goings:</b>   |     |      |          |           |                  |                  |

| S. No      | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1          | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|            |           | 3 No. 800 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|            |           | 4 No. 630 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|            |           | 1 No. 250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|            |           | <b>LT PANEL-3 (ACADEMIC) TTA PANEL</b> as described above.   | 1   | SET  |          |          | 1,107,499        | 1,107,499        |
| <b>1.3</b> | <b>MR</b> | <b>AHU/ TFA MAIN PANEL</b>   |     |      |          |          |                  |                  |
|            |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|            |           | <b>Incomer:</b>  |     |      |          |          |                  |                  |
|            |           | 1 No., 3200 A, 50 kA, 4P, MDO, ACB with:   |     |      |          |          |                  |                  |
| i.         |           | 230V, AC spring charging motor   |     |      |          |          |                  |                  |
| ii.        |           | 230V, AC closing coil  |     |      |          |          |                  |                  |
| iii.       |           | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.        |           | 4 NO + 4NC Aux. contacts   |     |      |          |          |                  |                  |
| v.         |           | In built trip LED's  |     |      |          |          |                  |                  |
| vi.        |           | Breaker control switch   |     |      |          |          |                  |                  |
|            |           | <b>Protection:</b>   |     |      |          |          |                  |                  |
| i.         |           | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |          |                  |                  |
| ii.        |           | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |          |                  |                  |
|            |           | <b>Metering &amp; Indications</b>  |     |      |          |          |                  |                  |
| i.         |           | R, Y, B LED indications (110V)   |     |      |          |          |                  |                  |
| ii.        |           | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |          |                  |                  |
| iii.       |           | Trip circuit healthy indications (24V DC)  |     |      |          |          |                  |                  |
| iv.        |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.         |           | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |          |                  |                  |
| vi.        |           | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |          |                  |                  |

| S. No      | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|------------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1          | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| vii.       |           | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.  |     |      |          |           |                  |                  |
|            |           | <b>Bus Bars:</b>   |     |      |          |           |                  |                  |
|            |           | 3500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels) |     |      |          |           |                  |                  |
|            |           | <b>Out goings:</b>   |     |      |          |           |                  |                  |
|            |           | 3 No. 630 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.      |     |      |          |           |                  |                  |
|            |           | 7 No. 400 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.      |     |      |          |           |                  |                  |
|            |           | 3 No. 250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.      |     |      |          |           |                  |                  |
|            |           | <b>AHU/ TFA MAIN PANEL as described above.</b>   | 1   | SET  |          | 2,003,905 |                  | 2,003,905        |
| <b>1.4</b> | <b>MR</b> | <b>SMOKE VENT. MAIN PANEL</b>  |     |      |          |           |                  |                  |
|            |           | IP Rating : IP 42  |     |      |          |           |                  |                  |
|            |           | <b>Incomer:</b>  |     |      |          |           |                  |                  |
|            |           | 1 No., 2500 A, 50 kA, 4P, MDO, ACB with:   |     |      |          |           |                  |                  |
| i.         |           | 230V, AC spring charging motor   |     |      |          |           |                  |                  |
| ii.        |           | 230V, AC closing coil  |     |      |          |           |                  |                  |
| iii.       |           | 24V, DC shunt trip coil  |     |      |          |           |                  |                  |
| iv.        |           | 4 NO + 4NC Aux. contacts   |     |      |          |           |                  |                  |
| v.         |           | In built trip LED's  |     |      |          |           |                  |                  |
| vi.        |           | Breaker control switch   |     |      |          |           |                  |                  |
|            |           | <b>Protection:</b>   |     |      |          |           |                  |                  |
| i.         |           | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |           |                  |                  |
| ii.        |           | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |           |                  |                  |
|            |           | <b>Metering &amp; Indications</b>  |     |      |          |           |                  |                  |
| i.         |           | R, Y, B LED indications (110V)   |     |      |          |           |                  |                  |
| ii.        |           | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |           |                  |                  |
| iii.       |           | Trip circuit healthy indications (24V DC)  |     |      |          |           |                  |                  |

| S. No      | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|------------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1          | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| iv.        |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |           |                  |                  |
| v.         |           | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |           |                  |                  |
| vi.        |           | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |           |                  |                  |
| vii.       |           |  |     |      |          |           |                  |                  |
|            |           | <b>Bus Bars:</b>   |     |      |          |           |                  |                  |
|            |           | 3000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)   |     |      |          |           |                  |                  |
|            |           | <b>Out goings:</b>   |     |      |          |           |                  |                  |
|            |           | 4 No. 630 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|            |           | 4 No. 400 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|            |           | 1 No. 315 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|            |           | 3 No. 200 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|            |           | <b>SMOKE VENT. MAIN PANEL as described above.</b>  | 1   | SET  |          | 1,736,987 |                  | 1,736,987        |
| <b>1.5</b> | <b>MR</b> | <b>LIFT PANEL 1,2, 3 &amp; 4</b>   |     |      |          |           |                  |                  |
|            |           | <b>IP Rating : IP42</b>  |     |      |          |           |                  |                  |
|            |           | <b>Incomer:</b>  |     |      |          |           |                  |                  |
|            |           | • 2 Nos 315A 3P, MCCB's, 35KA of suitable rating as per load.  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | <ul style="list-style-type: none"> <li>MCCB shall be with inbuilt micro-processor based O/C &amp; S/C releases.</li> <li>Both the releases shall be with adjustable trip settings.</li> <li>MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.</li> </ul>                         |     |      |          |          |                  |                  |
|       |         | <b>Incomer ATS</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 315A 4P, ATS <u>without bypass</u> and complete with overlapping neutral.  |     |      |          |          |                  |                  |
|       |         | <b>Incomer Indications:</b>  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>R,Y,B phase indication lamps.</li> <li>ON/OFF, Trip indication lamps.</li> <li>Indication lamps shall be LED type (110V).</li> </ul>  |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering:</b>   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>1 No. combined Digital VAF meter</li> <li>Meter shall be (110V) and communicable type.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering CT:</b>  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>CT metering Class-1 accuracy CT's (one per phase)</li> <li>CT shall be cast resin type &amp; shall be of suitable burden (VA) &amp; ratio.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering PT:</b>  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>415V / <math>\sqrt{3}</math> / 110V / <math>\sqrt{3}</math> PT for metering and indication lamps.</li> <li>PT shall be Class-1 accuracy.</li> <li>PT shall be cast resin type.</li> <li>PT shall be of suitable burden (VA).</li> </ul>                     |     |      |          |          |                  |                  |
|       |         | <b>Protection for Metering PT:</b>   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>TP MPCB of suitable rating &amp; fault withstand capacity on primary side of PT.</li> <li>TP MCB of suitable rating on secondary side of PT.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | <b>Bus Bars:</b>   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>400-A, 4P, 35 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | <b>Bus PT for outgoing:</b>  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>415V / <math>\sqrt{3}</math> / 110V / <math>\sqrt{3}</math> PT for metering and indication lamps of outgoing feeders.</li> <li>PT shall be Class-1 accuracy.</li> <li>PT shall be cast resin type.</li> <li>PT shall be of suitable burden (VA).</li> </ul> |     |      |          |          |                  |                  |
|       |         | <b>Protection for Bus PT:</b>  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>TP MPCB of suitable rating &amp; fault withstand capacity on primary side of PT.</li> </ul>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings:</b>   |     |      |          |          |                  |                  |
|       |         | • 10 Nos. 63 A 35 KA, 3P, MCCB's, motor duty with in-built thermal-magnetic S/C release for 12 KW Lift motor.   |     |      |          |          |                  |                  |
|       |         | 3 Nos. 63 A 10 KA, 4P MCB's.  |     |      |          |          |                  |                  |
|       | Notes:  | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.   |     |      |          |          |                  |                  |
|       |         | 2. All outgoings including spares shall have Digital Ammeter with 3 Nos. metering Class 1 accuracy cast resin CT's of suitable ratio & burden.  |     |      |          |          |                  |                  |
|       |         | Lift Panel 1, 2, 3 & 4 as described above.  | 4   | Set  |          | 533,058  |                  | 2,132,232        |
| 1.6   | MR      | <b>L+P PANEL-1 (GR.FLOOR):</b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 400A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 400 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 8Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 7Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-1 (GR.FLOOR) as described above.  | 1   | Set  |          | 475,553  |                  | 475,553          |
| 1.7   | MR      | <b><u>L+P PANEL-2 (GR.FLOOR):</u></b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 400A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 400 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 5Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 13Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 9Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |



| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | L+P PANEL-2 (GR.FLOOR) as described above.  | 1   | Set  |          | 514,287  |                  | 514,287          |
| 1.8   | MR      | <b>L+P PANEL-1 (1ST.FLOOR):</b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 400A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 400 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 500 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 8Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 7Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-1 (1ST.FLOOR) as described above.   | 1   | Set  |          | 511,087  |                  | 511,087          |
| 1.9   | MR      | <b>L+P PANEL-2 (1ST.FLOOR):</b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 400A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         | 1 No. 400 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 5Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|             |         | 5Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 5Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | L+P PANEL-2 (1ST.FLOOR) as described above.   | 1   | Set  |          | 479,142  |                  | 479,142          |
| <b>1.10</b> | MR      | <b>L+P PANEL-1 &amp; 2 (2ND.FLOOR):</b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 400A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 1 No. 400 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-1 & 2 (2nd.FLOOR) as described above.   | 2   | Set  |          | 465,631  |                  | 931,262          |
| 1.11  | MR      | <b><u>L+P PANEL-1 (3RD./4TH/5THFLOOR ):</u></b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 200A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 200 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 250 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 5Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-1 (3RD/4TH/5TH.FLOOR) as described above.   | 3   | Set  |          | 263,501  |                  | 790,503          |
| 1.12  | MR      | <b><u>L+P PANEL-2 (3RD/4TH/5TH.FLOOR ):</u></b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 200A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 200 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 250 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-2 (3RD/4TH/5TH.FLOOR) as described above.   | 3   | Set  |          | 230,425  |                  | 691,275          |
| 1.13  | MR      | <b><u>L+P PANEL-1 (6TH.FLOOR):</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 200A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 200 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 250 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | L+P PANEL-1 (6TH.FLOOR) as described above.   | 1   | Set  |          | 228,085  |                  | 228,085          |
| 1.14  | MR      | <b><u>L+P PANEL-2 (6TH.FLOOR):</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 200A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 200 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 250 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters  |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | <b>Spares</b>  |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|       |         | L+P PANEL-2 (6TH.FLOOR) as described above.  | 1   | Set  |          | 225,328  |                  | 225,328          |
| 1.15  | MR      | <b><u>L+P PANEL (BASEMENT):</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42  |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>   |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.   |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>   |     |      |          |          |                  |                  |
|       |         | 415V/ $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|       |         | 150 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs With 1No.KWH meters   |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |           | L+P PANEL (BASEMENT) as described above.  | 1   | Set  |          | 213,645  |                  | 213,645          |
| <b>1.16</b> | <b>MR</b> | <b>MED. EQP. PANEL</b>  |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |           | <b>Section-1:</b>   |     |      |          |          |                  |                  |
|             |           | <b>Incomer-1:</b>   |     |      |          |          |                  |                  |
|             |           | 1 No., 3200 A, 50 kA, 4P, EDO, ACB incomer with:  |     |      |          |          |                  |                  |
| i.          |           | 230V, AC spring charging motor  |     |      |          |          |                  |                  |
| ii.         |           | 230V, AC closing coil   |     |      |          |          |                  |                  |
| iii.        |           | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
| iv.         |           | 4 NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
| v.          |           | In built trip LED's   |     |      |          |          |                  |                  |
| vi.         |           | Breaker control switch  |     |      |          |          |                  |                  |
|             |           | <b>Protection:</b>  |     |      |          |          |                  |                  |
| i.          |           | In built micro processor based releases (O/C, S/C & E/F).   |     |      |          |          |                  |                  |
| ii.         |           | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)   |     |      |          |          |                  |                  |
|             |           | <b>Metering &amp; Indications</b>   |     |      |          |          |                  |                  |
| i.          |           | R, Y, B LED indications (110V)  |     |      |          |          |                  |                  |
| ii.         |           | ON, OFF, TRIP LED indications (24V DC)  |     |      |          |          |                  |                  |
| iii.        |           | Trip circuit healthy indications (24V DC)   |     |      |          |          |                  |                  |
| iv.         |           | 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.          |           | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.   |     |      |          |          |                  |                  |
| vi.         |           | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).   |     |      |          |          |                  |                  |
| vii.        |           | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.   |     |      |          |          |                  |                  |
|             |           | <b>Bus Bars:</b>  |     |      |          |          |                  |                  |
|             |           | 4000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|             |           | <b>Out goings:</b>  |     |      |          |          |                  |                  |



| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 2 No. 1250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 3 Nos. 1000 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps. |     |      |          |          |                  |                  |
|       |         | 2 Nos. 400 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 2 Nos. 200 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | <b>Bus Coupler - 1:</b>   |     |      |          |          |                  |                  |
|       |         | <b>Between Section 1 &amp; 2:</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 3200A, 50KA, 4P, EDO ACB with:  |     |      |          |          |                  |                  |
| i.    |         | 230V AC spring charging motor   |     |      |          |          |                  |                  |
| ii.   |         | 230V AC closing coil  |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
| iv.   |         | 4NO + 4NC Aux. contacts   |     |      |          |          |                  |                  |
|       |         | <b>Indications</b>  |     |      |          |          |                  |                  |
|       |         | ON, OFF LED indications (24V DC)  |     |      |          |          |                  |                  |
|       |         | <b>Section-2:</b>   |     |      |          |          |                  |                  |
|       |         | <b>Incomer-2:</b>   |     |      |          |          |                  |                  |
|       |         | 1 No., 3200 A, 50 kA, 4P, EDO, ACB incomer with:  |     |      |          |          |                  |                  |
| i.    |         | 230V, AC spring charging motor  |     |      |          |          |                  |                  |
| ii.   |         | 230V, AC closing coil   |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil   |     |      |          |          |                  |                  |
| iv.   |         | 4 NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
| v.    |         | In built trip LED's   |     |      |          |          |                  |                  |
| vi.   |         | Breaker control switch  |     |      |          |          |                  |                  |
|       |         | <b>Protection:</b>  |     |      |          |          |                  |                  |
| i.    |         | In built micro processor based releases (O/C, S/C & E/F).   |     |      |          |          |                  |                  |
| ii.   |         | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)   |     |      |          |          |                  |                  |
|       |         | <b>Metering &amp; Indications</b>   |     |      |          |          |                  |                  |
| i.    |         | R, Y, B LED indications (110V)  |     |      |          |          |                  |                  |
| ii.   |         | ON, OFF, TRIP LED indications (24V DC)  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| iii.  |         | Trip circuit healthy indications (24V DC)  |     |      |          |           |                  |                  |
| iv.   |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |           |                  |                  |
| v.    |         | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |           |                  |                  |
| vi.   |         | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |           |                  |                  |
| vii.  |         | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.  |     |      |          |           |                  |                  |
|       |         | <b>Bus Bars:</b>   |     |      |          |           |                  |                  |
|       |         | 4000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)   |     |      |          |           |                  |                  |
|       |         | <b>Out goings:</b>   |     |      |          |           |                  |                  |
|       |         | 2 No. 1250 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|       |         | 3 Nos. 1000 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|       |         | 2 Nos. 400 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|       |         | 2 Nos. 200 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|       |         | <b>MED. EQP. PANEL as described above.</b>   | 1   | SET  |          | 3,370,625 |                  | 3,370,625        |
| 1.17  | MR      | <b>MED. EQ. IMAGING PANEL-1 PANEL:</b>   |     |      |          |           |                  |                  |
|       |         | IP Rating : IP 42  |     |      |          |           |                  |                  |
|       |         | <b>Incomer</b>   |     |      |          |           |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6         | 7                | 8                |
|             |         | 2 Nos. 1000 A 35KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |           |                  |                  |
|             |         | <b>Incomer ATS</b>  |     |      |          |           |                  |                  |
|             |         | 1 No. 1000A, 4P, ATS without bypass and complete with overlapping neutral.  |     |      |          |           |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |           |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |           |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |           |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |           |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |           |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |           |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |           |                  |                  |
|             |         | 1200 A, 4P, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |           |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |           |                  |                  |
|             |         | 6 No. 100 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | 8 No. 63 A, 50 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |           |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |           |                  |                  |
|             |         | MED. EQ. IMAGING PANEL-1 as described above.  | 1   | Set  |          | 1,465,753 |                  | 1,465,753        |
| <b>1.18</b> | MR      | <b><u>MED. EQ. IMAGING PANEL-2 PANEL:</u></b>   |     |      |          |           |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |           |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |           |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6         | 7                | 8                |
|             |         | 2 Nos. 1000 A 35KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |           |                  |                  |
|             |         | <b>Incomer ATS</b>  |     |      |          |           |                  |                  |
|             |         | 1 No. 1000A, 4P, ATS without bypass and complete with overlapping neutral.  |     |      |          |           |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |           |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |           |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |           |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |           |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |           |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |           |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |           |                  |                  |
|             |         | 1200 A, 4P, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |           |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |           |                  |                  |
|             |         | 2 No. 315 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | 3 No. 250 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | 3 No. 125 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |           |                  |                  |
|             |         | MED. EQ. IMAGING PANEL-2 as described above.  | 1   | Set  |          | 1,425,188 |                  | 1,425,188        |
| <b>1.19</b> | MR      | <b><u>NUCLEAR MEDICINE PANEL:</u></b>   |     |      |          |           |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |           |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6         | 7                | 8                |
|             |         | <b>Incomer</b>  |     |      |          |           |                  |                  |
|             |         | 2 Nos. 1250 A 35KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |           |                  |                  |
|             |         | <b>Incomer ATS</b>  |     |      |          |           |                  |                  |
|             |         | 1 No. 1250A, 4P, ATS without bypass and complete with overlapping neutral.  |     |      |          |           |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |           |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |           |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |           |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |           |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |           |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |           |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |           |                  |                  |
|             |         | 1500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |           |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |           |                  |                  |
|             |         | 5 No. 315 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | 2 No. 125 A, 35 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |           |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |           |                  |                  |
|             |         | NUCLEAR MEDICINE PANEL as described above.  | 1   | Set  |          | 1,522,467 |                  | 1,522,467        |
| <b>1.20</b> | MR      | <b><u>TRAUMA &amp; ED IMAGING PANEL:</u></b>  |     |      |          |           |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |           |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |           |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | 2 Nos. 200 A 25KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                       |     |      |          |          |                  |                  |
|             |         | <b>Incomer ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 200A, 4P, ATS without bypass and complete with overlapping neutral.   |     |      |          |          |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 300 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 3 No. 125 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |          |                  |                  |
|             |         | 2 No. 63 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | TRAUMA & ED IMAGING PANEL as described above.   | 1   | Set  |          | 383,302  |                  | 383,302          |
| <b>1.21</b> | MR      | <b><u>CATHLAB PANEL (1ST FLOOR):</u></b>  |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | 2 Nos. 400 A 25KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer ATS</b>   |     |      |          |          |                  |                  |
|             |           | 1 No. 400A, 4P, ATS without bypass and complete with overlapping neutral.  |     |      |          |          |                  |                  |
|             |           | <b><u>Incomer Metering &amp; Indication:</u></b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT.  |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 500 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.   |     |      |          |          |                  |                  |
|             |           | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|             |           | 4 No. 250 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|             |           | CATHLAB PANEL (1ST FLOOR) as described above.  | 1   | Set  |          | 601,485  |                  | 601,485          |
| <b>1.22</b> | <b>MR</b> | <b>EMERGENCY LIGHTING UPS ISOLATOR IPD</b>   |     |      |          |          |                  |                  |
|             |           | 1No. 100 A 25 KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | <b><u>Metering &amp; Indication:</u></b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>EMERGENCY LIGHTING UPS ISOLATOR as described above</b>  | 2   | Set  |          | 27,653   |                  | 55,306           |
| <b>1.23</b> | <b>MR</b> | <b>UPS OUTPUT PANEL EM. LIGHTS IPD:</b>  |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 100A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication for each incomer:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 200 A, 3P+2N AL <sub>2</sub> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |           | Outgoings:   |     |      |          |          |                  |                  |
|             |           | 50 Nos. 63A 4P MCBs  |     |      |          |          |                  |                  |
|             |           | TVSS:  |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |



| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.  |     |      |          |          |                  |                  |
|             |         | <b>UPS OUTPUT PANEL EM. LIGHTS IPD as described above.</b>  | 1   | SET  |          | 345,397  |                  | 345,397          |
| <b>1.24</b> | MR      | <b>UPS PANEL-1 (GR. FLOOR) OFFICE/IT+LABS :</b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 150 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 5Nos.63 Amp,4P, 10kA MCBs   |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 3Nos.63 Amp,4P, 10kA MCBs   |     |      |          |          |                  |                  |
|             |         | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.  |     |      |          |          |                  |                  |
|             |         | UPS Panel-1 (Gr.Floor) as described above.  | 1   | SET  |          | 186,303  |                  | 186,303          |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 1.25  | MR      | <b>UPS PANEL-2 (GR. FLOOR) OFFICE/IT+LABS:</b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | UPS Panel-2 (Gr.Floor) as described above.  | 1   | SET  |          | 183,817  |                  | 183,817          |
| 1.26  | MR      | <b>UPS PANEL-1 (1st. FLOOR) OFFICE/IT+LABS:</b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 5Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | UPS Panel-1 (1st.Floor) as described above.   | 1   | SET  |          | 181,387  |                  | 181,387          |
| 1.27  | MR      | <b><u>UPS PANEL-2 (1st. FLOOR) OFFICE/IT+LABS:</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | UPS Panel-2 (1st.Floor) as described above.   | 1   | SET  |          | 179,512  |                  | 179,512          |
| 1.28  | MR      | <b><u>UPS PANEL-1 &amp; 2 (2nd. FLOOR) OFFICE/IT+LABS:</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 4Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | UPS Panel-1 & 2 (2nd.Floor) as described above.   | 2   | SET  |          | 180,118  |                  | 360,236          |
| 1.29  | MR      | <b><u>UPS PANEL-1 &amp; 2 (3rd./4th/5th FLOOR) OFFICE/IT+LABS:</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 150 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | UPS Panel-1&2 (3rd./4th/5thFloor) as described above.   | 6   | SET  |          | 178,595  |                  | 1,071,570        |
| <b>1.30</b> | MR      | <b><u>UPS PANEL-1 (6TH. FLOOR ) OFFICE/IT+LABS:</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 150 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 2Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |           | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |           | UPS Panel-1 (6TH.Floor) as described above.   | 1   | SET  |          | 172,991  |                  | 172,991          |
| <b>1.31</b> | <b>MR</b> | <b><u>UPS PANEL-2 (6TH. FLOOR ) OFFICE/IT+LABS:</u></b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |           | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |           | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |           | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |           | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |           | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |           | 1No.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |           | 3Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | UPS Panel-2 (6TH.Floor) as described above.   | 1   | SET  |          | 170,875  |                  | 170,875          |
| 1.32  | MR      | <b>UPS PANEL-1 (GR. FLOOR OT/ICUs):</b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|       |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 150 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | • 4 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | • 4 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |



| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | UPS Panel-1 (GR.Floor) as described above.  | 1   | SET  |          | 265,639  |                  | 265,639          |
| <b>1.33</b> | MR      | <b><u>UPS PANEL-1 (1ST. FLOOR OT/ICUs):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 630A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         | 1 No. 630 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 800 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | • 13 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.   |     |      |          |          |                  |                  |
|             |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|             |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|             |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | • 4 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|             |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|             |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|             |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | UPS Panel-1 (1ST.Floor) as described above.   | 1   | SET  |          | 926,085  |                  | 926,085          |
| <b>1.34</b> | MR      | <b><u>UPS PANEL-2 (1ST. FLOOR OT/ICUs):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 630A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         | 1 No. 630 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 800 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | • 15 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.   |     |      |          |          |                  |                  |
|             |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <ul style="list-style-type: none"> <li>Both the releases shall be with adjustable trip settings.</li> <li>MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.</li> </ul>   |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>  |     |      |          |          |                  |                  |
|             |         | <ul style="list-style-type: none"> <li>4 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.</li> <li>MCCB shall be with inbuilt micro-processor based O/C &amp; S/C releases.</li> <li>Both the releases shall be with adjustable trip settings.</li> <li>MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.</li> </ul> |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|             |         | UPS Panel-2 (1ST.Floor) as described above.  | 1   | SET  |          | 957,501  |                  | 957,501          |
| <b>1.35</b> | MR      | <b><u>UPS PANEL (3RD. FLOOR OT/ICUs ):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>   |     |      |          |          |                  |                  |
|             |         | 1 No. 200A, 4P, ATS without bypass but with complete overlapping neutral and required link work.   |     |      |          |          |                  |                  |
|             |         | 1 No. 200 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT.  |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |         | 300 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | • 6 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|             |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|             |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|             |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | • 4 Nos 63A 4P, MCCB's, 25KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|             |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |          |                  |                  |
|             |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |          |                  |                  |
|             |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | UPS Panel (3RD.Floor) as described above.   | 1   | SET  |          | 450,833  |                  | 450,833          |
| <b>1.36</b> | MR      | <b><u>UPS PANEL (5TH. &amp; 6TH FLOOR OT/ICUs ):</u></b>  |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | <b>ATS</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 100A, 4P, ATS without bypass but with complete overlapping neutral and required link work.  |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | 1 No. 100 A 35KA,3P+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                      |     |      |          |          |                  |                  |
|             |         |   |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 150 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|             |           | 2Nos.63 Amp,4P, 16kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Spares</b>  |     |      |          |          |                  |                  |
|             |           | 2Nos.63 Amp,4P, 16kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|             |           | UPS Panel (5TH. & 6TH Floor) as described above.   | 2   | SET  |          | 167,820  |                  | 335,640          |
| <b>1.37</b> | <b>MR</b> | <b>MAIN NORMAL PANEL-AYUSH BLOCK</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 1No. 630A 35KA, 4P, MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 800 A, 4P, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 200 A 35 KA, 4P MCCB's with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases.  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | 1 Nos. 125 A 35 KA, 4P MCCB's with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases.  |     |      |          |          |                  |                  |
|             |           | 2 Nos. 100 A 35 KA, 4P MCCB's with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases.  |     |      |          |          |                  |                  |
|             |           | 3 Nos. 63A 35 KA, 4P MCCB's with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases.  |     |      |          |          |                  |                  |
|             |           | 10 Nos. 63 A 10 KA, 4P MCB's   |     |      |          |          |                  |                  |
|             |           | 4 Nos. 25KA TP MPCBs   |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>MAIN NORMAL PANEL-AYUSH BLOCK as described above.</b>   | 1   | Set  |          | 279,867  |                  | 279,867          |
| <b>1.38</b> | <b>MR</b> | <b>UPS INPUT PANEL -Ayush Block:</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2No. 160.A 25KA, FP, MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | <b>Electrical Interlocking:</b>  |     |      |          |          |                  |                  |
|             |           | • Two incomers shall be electrically interlockeD through contactors , so that at any given time only any two breakers are 'ON'.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 200 A, 4P, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 25KA.  |     |      |          |          |                  |                  |
|             |           | Outgoings on section-1   |     |      |          |          |                  |                  |
|             |           | 4. Nos. 40 A 10 KA, DP MCB's   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | 4 No. 125 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |          |                  |                  |
|             |           | TVSS:   |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.  |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.   |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards  |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.   |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.  |     |      |          |          |                  |                  |
|             |           | <b>UPS INPUT PANEL - Ayush Block as described above.</b>  | 1   | SET  |          | 271,683  |                  | 271,683          |
| <b>1.39</b> | <b>MR</b> | <b>UPS OUTPUT PANEL - Ayush Block:</b>  |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |           | Incomer   |     |      |          |          |                  |                  |
|             |           | 2 No. 125 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | Incomer Metering & Indication for each incomer:   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |           | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Electrical Interlocking:</b>   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | • Two incomers shall be electrically interlocked through contactors , so that at any given time only any two breakers are 'ON'.  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 160 A, 3P+2N CU_ Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |           | Outgoings:   |     |      |          |          |                  |                  |
|             |           | 15. Nos. 63 A 10 KA, FP MCB's  |     |      |          |          |                  |                  |
|             |           | TVSS:  |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS OUTPUT PANEL - Ayush Block as described above.</b>  | 1   | SET  |          | 207,369  |                  | 207,369          |
| <b>1.40</b> | <b>MR</b> | <b>EMERGENCY LIGHTING UPS PANEL - Ayush Block:</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | Incomer  |     |      |          |          |                  |                  |
|             |           | 1 No.63 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | Incomer Metering & Indication for each incomer:  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |



| S. No       | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |         | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |         | 100 A, 3P+2N CU <sub>2</sub> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |         | <b>Outgoings:</b>  |     |      |          |          |                  |                  |
|             |         | 8. Nos. 40 A 10 KA, FP MCB's   |     |      |          |          |                  |                  |
|             |         | TVSS:  |     |      |          |          |                  |                  |
|             |         | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required. |     |      |          |          |                  |                  |
|             |         | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |         | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |         | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |         | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |         | <b>EMERGENCY LIGHTING UPS PANEL -Ayush Block as described above.</b>   | 1   | SET  |          | 108,355  |                  | 108,355          |
| <b>1.41</b> | MR      | <b><u>MAIN PANEL (MEDICAL SHARED LAB):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |         | 1 No. 800 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT.  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 1000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 17Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.125 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.200 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | 1No.63 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.125 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.200 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | Main Panel (Medical Shared Lab) as described above.   | 1   | Set  |          | 426,510  |                  | 426,510          |
| 1.42  | MR      | <b><u>MAIN PANEL (LIBRARY ADMIN):</u></b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 800 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 13Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.125 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.160 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 2Nos.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 6Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | 1No.63 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|             |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.125 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.160 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | Main Panel (Library Admin) as described above.  | 1   | Set  |          | 327,188  |                  | 327,188          |
| <b>1.43</b> | MR      | <b><u>MAIN PANEL (NURSING COLLEGE):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 630 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 800 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.   |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 10Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 3Nos.100 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 2Nos.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs  |     |      |          |          |                  |                  |
|       |         | 1No.63 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | Main Panel (Nursing College) as described above.  | 1   | Set  |          | 286,445  |                  | 286,445          |
| 1.44  | MR      | <b><u>MAIN PANEL (MEDICAL COLLEGE):</u></b>   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 800 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|       |         | 21Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 3Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.125 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|       |         | 10Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.125 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|       |         | Main Panel (Medical College) as described above.  | 1   | Set  |          | 363,942  |                  | 363,942          |
| 1.45  | MR      | <b>MAIN PANEL (MEDICAL LAB):</b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|       |         | 800 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |

| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 29Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 2NoS.100 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|             |         | 1No.200 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 2Nos.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 10Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |         | 1No.63 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|             |         | 1No.100 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.200 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |         | 1No.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | Main Panel (Medical Lab) as described above.  | 1   | Set  |          | 384,142  |                  | 384,142          |
| <b>1.46</b> | MR      | <b><u>MAIN PANEL (AUDITORIUM):</u></b>  |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 800 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 1000 A, TPN, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 14Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |         | 2Nos.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | 1No.160 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.200 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.250 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 2Nos.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |
|       |         | <b>Spares</b>  |     |      |          |          |                  |                  |
|       |         | 6Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 1No.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|       |         | 1No.160 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.200 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.250 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 1No.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|       |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|       |         | Main Panel (Auditorium) as described above.  | 1   | Set  |          | 428,690  |                  | 428,690          |
| 1.47  | MR      | <b><u>MAIN PANEL (DHARAMSHALA):</u></b>  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 42  |     |      |          |          |                  |                  |
|       |         | <b>Incomer</b>   |     |      |          |          |                  |                  |
|       |         | 1 No. 800 A 35KA,4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|       |         | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|       |         | 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|       |         | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|       |         | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|       |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|       |         | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|       |         | 1000 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 35 KA.  |     |      |          |          |                  |                  |
|       |         | <b>Outgoings</b>   |     |      |          |          |                  |                  |
|       |         | 9Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|       |         | 5Nos.63 Amp,4P,25kA MCCBs  |     |      |          |          |                  |                  |
|       |         | 2Nos.TP,25kA MPCB of suitable rating   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Spares</b>  |     |      |          |          |                  |                  |
|             |           | 5Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | 3No.63 Amp,4P,25kA MCCBs   |     |      |          |          |                  |                  |
|             |           | 1No.TP,25kA MPCB of suitable rating  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>  |     |      |          |          |                  |                  |
|             |           | Main Panel (Dharamshala) as described above.   | 1   | Set  |          | 334,648  |                  | 334,648          |
| <b>1.48</b> | <b>MR</b> | <b>EMERGENCY LIGHTING UPS ISOLATOR</b>   |     |      |          |          |                  |                  |
|             |           | 1No. 63 A 25 KA, 4P MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>EMERGENCY LIGHTING UPS ISOLATOR as described above</b>  | 8   | Set  |          | 86,112   |                  | 688,896          |
| <b>1.49</b> | <b>MR</b> | <b><u>EM.LIGHTING UPS PANEL (SHARED LAB,NUR.CLG &amp; LIBRARY ADMIN):</u></b>  |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 1 No. 63 A 25KA,TP+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT.  |     |      |          |          |                  |                  |



| S. No       | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 100 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.   |     |      |          |          |                  |                  |
|             |         | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |         | 3Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |         | 2Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |         | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |         | Em.Lighting UPS Panel (SHARED LAB,NUR.CLG & LIBRARY ADMIN) as described above.  | 3   | Set  |          | 88,869   |                  | 266,607          |
| <b>1.50</b> | MR      | <b><u>EM.LIGHTING UPS PANEL (MED.CLG.,MED LAB &amp; AUDI.):</u></b>   |     |      |          |          |                  |                  |
|             |         | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |         | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |         | 1 No. 63 A 25KA,TP+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                       |     |      |          |          |                  |                  |
|             |         | <b><u>Incomer Metering &amp; Indication:</u></b>  |     |      |          |          |                  |                  |
|             |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |         | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |         | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |         | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |         | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |         | 100 A, TP+2N, <u>Aluminium</u> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |           | 5Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |           | 3Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |
|             |           | Em.Lighting UPS Panel (MED.CLG.,MED LAB & AUDI.) as described above.  | 3   | Set  |          | 92,765   |                  | 278,295          |
| <b>1.51</b> | <b>MR</b> | <b><u>EM.LIGHTING UPS PANEL (LDHARAMSHALA):</u></b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42   |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>  |     |      |          |          |                  |                  |
|             |           | 1 No. 63 A 25KA,TP+2N MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.                                       |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio  |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>   |     |      |          |          |                  |                  |
|             |           | 100 A, TP+2N, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings</b>  |     |      |          |          |                  |                  |
|             |           | 2Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Spares</b>   |     |      |          |          |                  |                  |
|             |           | 2Nos.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | <b>Vendor to ensure selection of MCCB &amp; MCB through cascading effect to mitigate the prospective fault circuit current.</b>   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | Em.Lighting UPS Panel (Dharamshala) as described above.  | 1   | Set  |          | 89,041   |                  | 89,041           |
| <b>1.52</b> | <b>MR</b> | <b>UPS INPUT PANEL (NURSING COLLEGE) :</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 1No. 100A 25KA, FP, MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 200 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 25KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings :</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 40A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.   |     |      |          |          |                  |                  |
|             |           | 2Nos.40 Amp,DP,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>TVSS:</b>   |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | <b>Spare :</b>   |     |      |          |          |                  |                  |
|             |           | 1 No. 40 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases  |     |      |          |          |                  |                  |
|             |           | 1No.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS INPUT PANEL(NURSING COLLEGE) as described above.</b>  | 1   | SET  |          | 146,144  |                  | 146,144          |
| <b>1.53</b> | <b>MR</b> | <b>UPS INPUT PANEL (LIBRARY ADMIN,MED.CLG&amp; AUDI. ) :</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 1No. 100A 25KA, FP, MCCB (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication:</b>  |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital VAF + PF Meter (110V) (With RS 485 Port)   |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 200 A, TPN, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 25KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings :</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 63 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|             |           | 2Nos.40 Amp,DP,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>TVSS:</b>   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | <b>Spare :</b>   |     |      |          |          |                  |                  |
|             |           | 1 No. 63 A, 25 KA, FP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases  |     |      |          |          |                  |                  |
|             |           | 1No.40 Amp,DP,10kA MCBs  |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS INPUT PANEL(LIBRARY ADMIN,MED.CLG&amp; AUDI.) as described above.</b>   | 3   | SET  |          | 146,144  |                  | 438,432          |
| <b>1.54</b> | <b>MR</b> | <b>UPS OUTPUT PANEL (LIBRARY ADMIN):</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 63 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication for each incomer:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 100 A, 3P+2N AL <sub>2</sub> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | <b>Outgoings:</b>  |     |      |          |          |                  |                  |
|             |           | 6Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>TVSS:</b>   |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | <b>Spare:</b>  |     |      |          |          |                  |                  |
|             |           | 3Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS OUTPUT PANEL (LIBRARY ADMIN) as described above.</b>  | 1   | SET  |          | 147,414  |                  | 147,414          |
| <b>1.55</b> | <b>MR</b> | <b>UPS OUTPUT PANEL (NURSING COLLEGE):</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 63 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.   |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication for each incomer:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |
|             |           | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | 100 A, 3P+2N AL_ Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings:</b>  |     |      |          |          |                  |                  |
|             |           | 3Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>TVSS:</b>   |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | <b>Spare:</b>  |     |      |          |          |                  |                  |
|             |           | 2Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS OUTPUT PANEL (NURSING COLLEGE) as described above.</b>  | 1   | SET  |          | 147,542  |                  | 147,542          |
| <b>1.56</b> | <b>MR</b> | <b>UPS OUTPUT PANEL (MEDICAL COLLEGE):</b>   |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 100 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication for each incomer:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |
|             |           | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------------|-----------|--|-----|------|----------|----------|------------------|------------------|
| 1           | 1A        | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|             |           | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |     |      |          |          |                  |                  |
|             |           | <b>Bus bars</b>  |     |      |          |          |                  |                  |
|             |           | 150 A, 3P+2N AL <sub>2</sub> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |     |      |          |          |                  |                  |
|             |           | <b>Outgoings:</b>  |     |      |          |          |                  |                  |
|             |           | 9Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | <b>TVSS:</b>   |     |      |          |          |                  |                  |
|             |           | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required.   |     |      |          |          |                  |                  |
|             |           | <b>Spare:</b>  |     |      |          |          |                  |                  |
|             |           | 4Nos.63 Amp,4P,10kA MCBs   |     |      |          |          |                  |                  |
|             |           | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |     |      |          |          |                  |                  |
|             |           | Protections, Indication & metering as per general notes & specification of panel & switch boards   |     |      |          |          |                  |                  |
|             |           | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |     |      |          |          |                  |                  |
|             |           | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |     |      |          |          |                  |                  |
|             |           | <b>UPS OUTPUT PANEL (MEDICAL COLLEGE) as described above.</b>  | 1   | SET  |          | 160,246  |                  | 160,246          |
| <b>1.57</b> | <b>MR</b> | <b>UPS OUTPUT PANEL (AUDITORIUM):</b>  |     |      |          |          |                  |                  |
|             |           | IP Rating : IP 42  |     |      |          |          |                  |                  |
|             |           | <b>Incomer</b>   |     |      |          |          |                  |                  |
|             |           | 2 Nos. 100 A 25 KA, TP+2N MCCB and neutral isolation link 200% (fixed Thermal & fixed Magnetic releases) upto 250A, thermal-magnetic releases OR Micro-Processor based releases beyond 250A. MCCB shall have 1NO + 1NC auxiliary contacts + a trip contact.  |     |      |          |          |                  |                  |
|             |           | <b>Incomer Metering &amp; Indication for each incomer:</b>   |     |      |          |          |                  |                  |
|             |           | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
|             |           | R,Y,B phase indication lamps (110V) LED Type   |     |      |          |          |                  |                  |
|             |           | ON' & Trip indication lamps (110V) LED Type  |     |      |          |          |                  |                  |



| S. No    | Code No | Item Description   | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|----------|---------|--|-------|-------|----------|----------|------------------|-------------------|
| 1        | 1A      | 2  | 3     | 4     | 5        | 6        | 7                | 8                 |
|          |         | Cast resin metering CT's for each phase of class-1 accuracy & of suitable burden & ratio   |       |       |          |          |                  |                   |
|          |         | 1 No. Digital Multifunction meter (110V) (With RS 485 Port)  |       |       |          |          |                  |                   |
|          |         | <b>Bus bars</b>  |       |       |          |          |                  |                   |
|          |         | 150 A, 3P+2N AL <sub>2</sub> Bus bars of Electrolytic grade with heat shrinkable sleeves 25 KA.  |       |       |          |          |                  |                   |
|          |         | <b>Outgoings:</b>  |       |       |          |          |                  |                   |
|          |         | 3Nos.63 Amp,4P,10kA MCBs   |       |       |          |          |                  |                   |
|          |         | <b>TVSS:</b>   |       |       |          |          |                  |                   |
|          |         | Supply, installation, testing & commissioning of 36 kA surge handling capacity TVSS with 10 mode protection including EMI & RFI filters and with inbuilt back up fuse protection, with 4P MCB of 50 kA breaking capacity and complete with wiring as required. |       |       |          |          |                  |                   |
|          |         | <b>Spare:</b>  |       |       |          |          |                  |                   |
|          |         | 2Nos.63 Amp,4P,10kA MCBs   |       |       |          |          |                  |                   |
|          |         | All UPS & UPS output panels to have a raw body earth bus & a dedicated earth bus on insulated supports.  |       |       |          |          |                  |                   |
|          |         | Protections, Indication & metering as per general notes & specification of panel & switch boards   |       |       |          |          |                  |                   |
|          |         | Surge Protection device to be earthed suitably as per manufacturers recommendation.  |       |       |          |          |                  |                   |
|          |         | Vendor to ensure selection of MCCB & MCB through cascading effect to mitigate the prospective fault circuit current.   |       |       |          |          |                  |                   |
|          |         | <b>UPS OUTPUT PANEL (AUDITORIUM) as described above.</b>   | 1     | SET   |          | 147,639  |                  | 147,639           |
|          |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>   |       |       |          |          | -                | <b>39,959,248</b> |
| <b>2</b> |         | <b>MV CABLES, CABLE JOINTING &amp; END TERMINATIONS</b>  |       |       |          |          |                  |                   |
| 2.3      | 7.8     | Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 kV grade of following size on cable tray as required.   |       |       |          |          |                  |                   |
| 2.3.1    | 7.8.1   | Upto 35 sq. mm (clamped with 1mm thick saddle)   | 10805 | Metre | 21       |          | 226,905          |                   |
| 2.3.2    | 7.8.2   | Above 35 sq. mm and upto 95 sq. mm (clamped with 25x3mm MS flat clamp)   | 3741  | Metre | 49       |          | 183,309          |                   |
| 2.3.3    | 7.8.3   | Above 95 sq. mm and upto 185 sq. mm (clamped with 40x3mm MS flat clamp)  | 4750  | Metre | 61       |          | 289,750          |                   |

| S. No  | Code No | Item Description  | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-------|-------|----------|----------|------------------|------------------|
| 1      | 1A      | 2   | 3     | 4     | 5        | 6        | 7                | 8                |
| 2.3.4  | 7.8.4   | Above 185 sq. mm and upto 400 sq. mm (clamped with 40x3mm MS flat clamp)  | 9150  | Metre | 96       |          | 878,400          |                  |
| 2.4    | 9.1     | Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required.   |       |       |          |          |                  |                  |
| 2.4.1  | 9.1.30  | 3.5 C x 300 Sqmm  | 978   | Each  | 1106     |          | 1,081,668        |                  |
| 2.4.2  | 9.1.29  | 3.5 C x 240 Sqmm  | 28    | Each  | 989      |          | 27,692           |                  |
| 2.4.3  | 9.1.27  | 3.5 C x 185 Sqmm  | 32    | Each  | 804      |          | 25,728           |                  |
| 2.4.4  | 9.1.26  | 3.5 C x 150 Sqmm  | 24    | Each  | 592      |          | 14,208           |                  |
| 2.4.5  | 9.1.25  | 3.5 C x 120 Sqmm  | 32    | Each  | 500      |          | 16,000           |                  |
| 2.4.6  | 9.1.24  | 3.5 C x 95 Sqmm   | 46    | Each  | 482      |          | 22,172           |                  |
| 2.4.7  | 9.1.22  | 3.5C x 50 Sqmm  | 18    | Each  | 354      |          | 6,372            |                  |
| 2.4.8  | 9.1.21  | 3.5C x 35 Sqmm  | 90    | Each  | 282      |          | 25,380           |                  |
| 2.4.9  | 9.1.13  | 3C x 95 Sqmm  | 2     | Each  | 431      |          | 862              |                  |
| 2.4.10 | 9.1.11  | 3C x 50 Sqmm  | 2     | Each  | 286      |          | 572              |                  |
| 2.4.11 | 9.1.9   | 3C x 25 Sqmm  | 2     | Each  | 205      |          | 410              |                  |
| 2.4.12 | 9.1.8   | 3C x 16 Sqmm  | 14    | Each  | 394      |          | 5,516            |                  |
| 2.4.13 | 9.1.34  | 4 C x 25 Sqmm   | 88    | Each  | 258      |          | 22,704           |                  |
| 2.4.14 | 9.1.33  | 4 C x 16 Sqmm   | 850   | Each  | 255      |          | 216,750          |                  |
| 2.4.15 | 9.1.32  | 4 C x 10 Sqmm   | 306   | Each  | 203      |          | 62,118           |                  |
| 2.5    | MR      | Supply, loading, transportation unloading at site, storages at site, shifting from storage place to site of following sizes of 1.1kV grade XLPE insulated, Extruded PVC inner sheathed & overall FR-LSH PVC outer sheathed, Aluminium conductor, <b>Armoured cables</b> as per IS:7098 Part-I or amended upto date and as per specifications. |       |       |          |          |                  |                  |
| 2.5.1  | MR      | 3.5 C x 300 Sqmm  | 8256  | Metre |          | 1,164    |                  | 9,609,984        |
| 2.5.2  | MR      | 3.5 C x 240 Sqmm  | 194   | Metre |          | 949      |                  | 184,106          |
| 2.5.3  | MR      | 3.5 C x 185 Sqmm  | 823   | Metre |          | 755      |                  | 621,365          |
| 2.5.4  | MR      | 3.5 C x 150 Sqmm  | 2433  | Metre |          | 605      |                  | 1,471,965        |
| 2.5.5  | MR      | 3.5 C x 120 Sqmm  | 927   | Metre |          | 511      |                  | 473,697          |
| 2.5.6  | MR      | 3.5 C x 95 Sqmm   | 970   | Metre |          | 409      |                  | 396,730          |
| 2.5.7  | MR      | 3.5C x 50 Sqmm  | 378   | Metre |          | 249      |                  | 94,122           |
| 2.5.8  | MR      | 3.5C x 35 Sqmm  | 1022  | Metre |          | 192      |                  | 196,224          |
| 2.5.9  | MR      | 3C x 95 Sqmm  | 42    | Metre |          | 360      |                  | 15,120           |
| 2.5.10 | MR      | 3C x 50 Sqmm  | 58    | Metre |          | 216      |                  | 12,528           |
| 2.5.11 | MR      | 3C x 25 Sqmm  | 47    | Metre |          | 135      |                  | 6,345            |
| 2.5.12 | MR      | 3C x 16 Sqmm  | 328   | Metre |          | 107      |                  | 35,096           |
| 2.5.13 | MR      | 4 C x 25 Sqmm   | 2564  | Metre |          | 164      |                  | 420,496          |
| 2.5.14 | MR      | 4 C x 16 Sqmm   | 23003 | Metre |          | 127      |                  | 2,921,381        |
| 2.6    | MR      | <b>SUPPLY &amp; LAYING OF CABLES:</b>   |       |       |          |          |                  |                  |

| S. No        | Code No   | Item Description  | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------|-----------|---|------|------|----------|----------|------------------|------------------|
| 1            | 1A        | 2   | 3    | 4    | 5        | 6        | 7                | 8                |
|              |           | Supply, Laying, Fixing, Testing & Commissioning of following sizes of 1.1kV grade <b>Single core LT FRLS PVC insulated, PVC sheathed, multi strand, flexible Copper conductor Un. Ar.</b> Cables as per <b>IS:1554 on existing cable trays/ in existing hume pipes/ PVC pipes/ GI pipes/ on surface of slabs, walls or masonry/ RCC trenches/ ducts including cables ties, GI saddles, clamps and necessary hard ware.</b>  |      |      |          |          |                  |                  |
| 2.6.1        | MR        | 1C x 300 sq.mm. Cu. Un. Ar. Flexible cable  | 1270 | RM   |          | 2,586    |                  | 3,284,220        |
| 2.6.2        | MR        | 1C x 240 sq.mm. Cu. Un. Ar. Flexible cable  | 735  | RM   |          | 2,252    |                  | 1,655,220        |
| 2.6.3        | MR        | 1C x 120 sq.mm. Cu. Un. Ar. Flexible cable  | 160  | RM   |          | 1,065    |                  | 170,400          |
| 2.6.4        | MR        | 1C x 95 sq.mm. Cu. Un. Ar. Flexible cable   | 500  | RM   |          | 902      |                  | 451,000          |
| 2.6.5        | MR        | 1C x 35 sq.mm. Cu. Un. Ar. Flexible cable   | 650  | RM   |          | 334      |                  | 217,100          |
| <b>Note:</b> |           | <b>For Input cables to UPS from UPS input panel &amp; output cable from UPS to UPS out panel.</b>   |      |      |          |          |                  |                  |
| <b>2.7</b>   | <b>MR</b> | <b>END TERMINATION</b>  |      |      |          |          |                  |                  |
|              |           | Supply and making end terminal joints for the following sizes of 1.1 KV grade PVC insulated Copper conductor cables, including providing tinned copper terminal lugs, single compression brass cable glands, insulation tape, effecting terminal connections to the equipment complete as required.   |      |      |          |          |                  |                  |
| 2.7.1        | MR        | 1C x 300 sq.mm. Cu. Un. Ar. Flexible cable  | 40   | Each |          | 1,136    |                  | 45,440           |
| 2.7.2        | MR        | 1C x 240 sq.mm. Cu. Un. Ar. Flexible cable  | 20   | Each |          | 843      |                  | 16,860           |
| 2.7.3        | MR        | 1C x 120 sq.mm. Cu. Un. Ar. Flexible cable  | 10   | Each |          | 517      |                  | 5,170            |
| 2.7.4        | MR        | 1C x 95 sq.mm. Cu. Un. Ar. Flexible cable   | 20   | Each |          | 438      |                  | 8,760            |
| 2.7.5        | MR        | 1C x 35 sq.mm. Cu. Un. Ar. Flexible cable   | 50   | Each |          | 299      |                  | 14,950           |
| <b>2.8.</b>  |           | <b>SUPPLY OF FIRE SURVIVAL CABLES : ALUMINIUM CONDUCTOR</b>   |      |      |          |          |                  |                  |
|              |           | Supply of Fire Survival armoured cables of 600/1000V rated with Aluminium circular conductor having glass mica fire barrier tape covered by an extruded layer of High module Ethylene Propylene Rubber (HEPR) insulation and LSZH inner & outer sheath. Generally as per BS 7846, IEC-60502-1 & BS-8519 (latest edition). Should retain circuit integrity as per BS 8491:2008 (120 mins) for cables having overall dia of 20mm and above. Cables with overall dia below 20 mm should retain circuit integrity as per BS 8434-2. 3rd Party inspection required prior to despatch of every lot. |      |      |          |          |                  |                  |
| 2.8.1        | MR        | 3.5c x 300 Sq.mm  | 248  | RM   |          | 2,251    |                  | 558,248          |
| 2.8.2        | MR        | 3.5c x 240 Sq.mm  | 630  | RM   |          | 1,931    |                  | 1,216,530        |
| 2.8.3        | MR        | 3.5c x 50 Sq.mm   | 95   | RM   |          | 484      |                  | 45,980           |
| 2.8.4        | MR        | 3c x 150 Sq.mm  | 58   | RM   |          | 1,033    |                  | 59,914           |
| 2.8.5        | MR        | 3c x 120 Sq.mm  | 58   | RM   |          | 838      |                  | 48,604           |
| 2.8.6        | MR        | 3c x 70 Sq.mm   | 89   | RM   |          | 564      |                  | 50,196           |
| 2.8.7        | MR        | 3c x 50 Sq.mm   | 42   | RM   |          | 418      |                  | 17,556           |
| 2.8.8        | MR        | 3c x 35 Sq.mm   | 164  | RM   |          | 332      |                  | 54,448           |
| 2.8.9        | MR        | 3c x 25 Sq.mm   | 47   | RM   |          | 262      |                  | 12,314           |

| S. No   | Code No | Item Description  | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------|---------|---|------|------|----------|----------|------------------|------------------|
| 1       | 1A      | 2   | 3    | 4    | 5        | 6        | 7                | 8                |
| 2.8.10  | MR      | 3c x 16 Sq.mm   | 160  | RM   |          | 208      |                  | 33,280           |
| 2.8.11  | MR      | 4c x 25 Sq.mm   | 1679 | RM   |          | 621      |                  | 1,042,659        |
| 2.8.12  | MR      | 4c x 16 Sq.mm   | 278  | RM   |          | 415      |                  | 115,370          |
| 2.9.    |         | <b>LAYING OF FIRE SURVIVAL CABLES- ON EXISTING TRAYS / IN EXISTING DUCTS / IN EXISTING CIVIL TRENCHES: : ALUMINIUM CONDUCTOR</b>  |      |      |          |          |                  |                  |
|         |         | Laying, Fixing, Testing & Commissioning of <b>Fire Resistant cables on existing cable trays/ in existing hume pipes/ PVC pipes/ GI pipes/ on surface of slabs, walls or masonry/ RCC trenches/ ducts</b> including cables ties, GI saddles, clamps and necessary hard ware. |      |      |          |          |                  |                  |
| 2.9.1   | MR      | 3.5c x 300 Sq.mm  | 248  | RM   |          | 136      |                  | 33,728           |
| 2.9.2   | MR      | 3.5c x 240 Sq.mm  | 630  | RM   |          | 115      |                  | 72,450           |
| 2.9.3   | MR      | 3.5c x 50 Sq.mm   | 95   | RM   |          | 77       |                  | 7,315            |
| 2.9.4   | MR      | 3c x 150 Sq.mm  | 58   | RM   |          | 77       |                  | 4,466            |
| 2.9.5   | MR      | 3c x 120 Sq.mm  | 58   | RM   |          | 77       |                  | 4,466            |
| 2.9.6   | MR      | 3c x 70 Sq.mm   | 89   | RM   |          | 77       |                  | 6,853            |
| 2.9.7   | MR      | 3c x 50 Sq.mm   | 42   | RM   |          | 77       |                  | 3,234            |
| 2.9.8   | MR      | 3c x 35 Sq.mm   | 164  | RM   |          | 77       |                  | 12,628           |
| 2.9.9   | MR      | 3c x 25 Sq.mm   | 47   | RM   |          | 45       |                  | 2,115            |
| 2.9.10  | MR      | 3c x 16 Sq.mm   | 160  | RM   |          | 39       |                  | 6,240            |
| 2.9.11  | MR      | 4c x 25 Sq.mm   | 1679 | RM   |          | 45       |                  | 75,555           |
| 2.9.12  | MR      | 4c x 16 Sq.mm   | 278  | RM   |          | 39       |                  | 10,842           |
| 2.10.   |         | <b>CABLE TERMINATION : ALUMINIUM CONDUCTOR</b>  |      |      |          |          |                  |                  |
|         |         | Cable end Termination of <b>Fire SURVIVAL Cables</b> including cost of Aluminium, heavy duty crimping lugs, double compression glands, insulation tape and all necessary material to complete the termination. Termination shall be fire safe,                              |      |      |          |          |                  |                  |
| 2.10.1  | MR      | 3.5c x 300 Sq.mm  | 14   | Nos. |          | 2,583    |                  | 36,162           |
| 2.10.2  | MR      | 3.5c x 240 Sq.mm  | 6    | Nos. |          | 2,195    |                  | 13,170           |
| 2.10.3  | MR      | 3.5c x 50 Sq.mm   | 4    | Nos. |          | 1,168    |                  | 4,672            |
| 2.10.4  | MR      | 3c x 150 Sq.mm  | 2    | Nos. |          | 1,606    |                  | 3,212            |
| 2.10.5  | MR      | 3c x 120 Sq.mm  | 2    | Nos. |          | 1,498    |                  | 2,996            |
| 2.10.6  | MR      | 3c x 70 Sq.mm   | 4    | Nos. |          | 1,164    |                  | 4,656            |
| 2.10.7  | MR      | 3c x 50 Sq.mm   | 2    | Nos. |          | 1,086    |                  | 2,172            |
| 2.10.8  | MR      | 3c x 35 Sq.mm   | 8    | Nos. |          | 1,058    |                  | 8,464            |
| 2.10.9  | MR      | 3c x 25 Sq.mm   | 18   | Nos. |          | 651      |                  | 11,718           |
| 2.10.10 | MR      | 3c x 16 Sq.mm   | 10   | Nos. |          | 574      |                  | 5,740            |
| 2.10.11 | MR      | 4c x 25 Sq.mm   | 100  | Nos. |          | 655      |                  | 65,500           |
| 2.10.12 | MR      | 4c x 16 Sq.mm   | 26   | Nos. |          | 576      |                  | 14,976           |
| 2.11.   |         | <b>SUPPLY OF FIRE SURVIVAL CABLES : COPPER CONDUCTOR</b>  |      |      |          |          |                  |                  |

| S. No  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|--------|---------|--|-----|------|----------|----------|------------------|-------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                 |
|        |         | Supply of Fire Survival armoured cables of 600/1000V rated with Copper circular conductor having glass mica fire barrier tape covered by an extruded layer of High module Ethylene Propylene Rubber (HEPR) insulation and LSZH inner & outer sheath. Generally as per BS 7846, IEC-60502-1 & BS-8519 (latest edition). Should retain circuit integrity as per BS 8491:2008 (120 mins) for cables having overall dia of 20mm and above. Cables with overall dia below 20 mm should retain circuit integrity as per BS 8434-2. 3rd Party inspection required prior to despatch of every lot. |     |      |          |          |                  |                   |
| 2.11.1 | MR      | 4c x 25 Sq.mm  | 200 | RM   |          | 1,248    |                  | 249,600           |
| 2.11.2 | MR      | 4c x 16 Sq.mm  | 682 | RM   |          | 872      |                  | 594,704           |
| 2.11.3 | MR      | 1c x 25 Sq.mm  | 25  | RM   |          | 372      |                  | 9,300             |
| 2.11.4 | MR      | 1c x 16 Sq.mm  | 150 | RM   |          | 245      |                  | 36,750            |
|        |         |  |     |      |          |          |                  |                   |
| 2.12.  |         | <b>LAYING OF FIRE SURVIVAL CABLES- ON EXISTING TRAYS / IN EXISTING DUCTS / IN EXISTING CIVIL TRENCHES: : COPPER CONDUCTOR</b>  |     |      |          |          |                  |                   |
|        |         | Laying, Fixing, Testing & Commissioning of <b>Fire Resistant cables on existing cable trays/ in existing hume pipes/ PVC pipes/ GI pipes/ on surface of slabs, walls or masonry/ RCC trenches/ ducts</b> including cables ties, GI saddles, clamps and necessary hard ware.  |     |      |          |          |                  |                   |
|        |         |  |     |      |          |          |                  |                   |
| 2.12.1 | MR      | 4c x 25 Sq.mm  | 200 | RM   |          | 30       |                  | 6,000             |
| 2.12.2 | MR      | 4c x 16 Sq.mm  | 682 | RM   |          | 30       |                  | 20,460            |
| 2.12.3 | MR      | 1c x 25 Sq.mm  | 25  | RM   |          | 30       |                  | 750               |
| 2.12.4 | MR      | 1c x 16 Sq.mm  | 150 | RM   |          | 30       |                  | 4,500             |
|        |         |  |     |      |          |          |                  |                   |
| 2.13.  |         | <b>CABLE TERMINATION : : COPPER CONDUCTOR</b>  |     |      |          |          |                  |                   |
|        |         | Cable end Termination of <b>Fire SURVIVAL Cables</b> including cost of Copper, heavy duty crimping lugs, double compression glands, insulation tape and all necessary material to complete the termination. Termination shall be fire safe,  |     |      |          |          |                  |                   |
|        |         |  |     |      |          |          |                  |                   |
| 2.13.1 | MR      | 4c x 25 Sq.mm  | 4   | Nos. |          | 621      |                  | 2,484             |
| 2.13.2 | MR      | 4c x 16 Sq.mm  | 2   | Nos. |          | 564      |                  | 1,128             |
| 2.13.3 | MR      | 3c x 10 Sq.mm  | 8   | Nos. |          | 435      |                  | 3,480             |
| 2.13.4 | MR      | 3c x 6 Sq.mm   | 16  | Nos. |          | 384      |                  | 6,144             |
| 2.13.5 | MR      | 1c x 25 Sq.mm  | 10  | Nos. |          | 582      |                  | 5,820             |
| 2.13.6 | MR      | 1c x 16 Sq.mm  | 60  | Nos. |          | 541      |                  | 32,460            |
|        |         |  |     |      |          |          |                  |                   |
|        |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>   |     |      |          |          | <b>3,106,516</b> | <b>26,970,288</b> |
|        |         |  |     |      |          |          |                  |                   |
| 3      |         | <b>RISING MAINS &amp; BUS DUCT - OUTDOOR (IN AIR - OVER HEAD, OUTDOOR TYPE) IP 66</b>  |     |      |          |          |                  |                   |
| 3.1    | MR      | <b>RISING MAINS - (UPS POWER- Offices/ IT-Labs) INDOOR (RUNNING IN THE ELECTRICAL SHAFTS/ THROUGH ELECTRICAL ROOMS)</b>  |     |      |          |          |                  |                   |

| S. No         | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1             | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|               |         | Design, Manufacture, Supply, Installation, Testing, and Commissioning of <b>Sandwich Bus way</b> 650 volts system rising mains with cooling Fins, <b>6bar - 3PH, 2N &amp; 1E Aluminium conductor</b> , with aluminium body/ powder coated sheet steel enclosure with 2x25x6 aluminium earth tape as earth throughout the continuous length as per specification suitable for <b>3ph 4wire 50HZ</b> , of short circuit fault withstand capacity for 1 Sec as specified below. The bus way shall have system for plug in tap off box at desired levels and single bolt double head section jointing system. Jointing system shall be with thermal sensitive temperature indicators. The Tap off boxes shall have Door Interlocking mechanism and mechanical interlocking with Bus duct housing during 'ON' position to prevent being taking of in energized condition. Supporting system shall be fail proof even in the earth quake situations, as per seismic requirement of site. |     |      |          |          |                  |                  |
| <b>Notes:</b> |         |  |     |      |          |          |                  |                  |
| 1             |         | For Rising Mains, no temperature deration upto 45°C, Ambient temperature.  |     |      |          |          |                  |                  |
| 2             |         | Flexible connections need to be included in the price and need to be provided as required for thermal expansion/ building expansion joints/ panel end connections/ one vertical expansion for every floor.   |     |      |          |          |                  |                  |
| 3             |         | 200% Neutral & 100% Internal earth type Rising Main.   |     |      |          |          |                  |                  |
| 4             |         | 200% sized Neutral as of phase current.  |     |      |          |          |                  |                  |
| 3.1.1         | MR      | End flange at Panel end (if no cable adaptor box). i.e. if no incoming cable connection & Rising Main starting directly from the UPS Output Panel. (IP55)<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)<br>RISING MAIN STARTING FROM UPS OUTPUT PANEL:  | 2   | Nos. |          | 2,391    |                  | 4,782            |
| 3.1.2         | MR      | Horizontal Run<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 200 | RM   |          | 15,605   |                  | 3,121,000        |
| 3.1.3         | MR      | Vertical Run<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 80  | RM   |          | 15,605   |                  | 1,248,400        |
| 3.1.4         | MR      | Horizontal Expansion Joints<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)   | 20  | Nos. |          | 21,573   |                  | 431,460          |
| 3.1.5         | MR      | Vertical Expansion Joints<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)   | 8   | Nos. |          | 21,573   |                  | 172,584          |
| 3.1.6         | MR      | Vertical Bends<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 8   | Nos. |          | 1,912    |                  | 15,296           |
| 3.1.7         | MR      | Horizontal Bends   |     |      |          |          |                  |                  |

| S. No         | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1             | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|               |         | 300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 12  | Nos. |          | 1,912    |                  | 22,944           |
| 3.1.8         | MR      | Offsets<br>300 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)   | 2   | Nos. |          | 3,827    |                  | 7,654            |
| 3.2.          | MR      | <b>TAP-OFF BOXES - INDOOR:</b>   |     |      |          |          |                  |                  |
|               |         | Supply and installation of following <b>3P MCCB ± 2N Link</b> of breaking capacity as called for, for fixing in the incoming <b>Tap-off box</b> . Tap-off box housing shall be fabricated out of 14G CRCA painted or powder coated (as approved) sheet steel. The tap-off box should be factory fabricated and complete with solid aluminium links of rated capacity from MCCB to rising mains and suitable size of gland plate etc. The tap-off box shall be suitable for termination of XLPE insulated Al. conductor armoured cable including shrouding of terminal ends. as required.   |     |      |          |          |                  |                  |
| 3.2.1         | MR      | 100 Amp, <b>3P MCCB + 2N Link</b> , 35KA (with adjustable thermal release & adjustable magnetic release upto 250A & microprocessor based release beyond 250A). (IP54)  | 28  | Nos. |          | 62,132   |                  | 1,739,696        |
| 3.3           | MR      | <b>RISING MAINS - (UPS POWER- ICU's/ NICU's/ Emergency &amp; Dialysis beds) INDOOR (RUNNING IN THE ELECTRICAL SHAFTS/THROUGH ELECTRICAL ROOMS)</b>   |     |      |          |          |                  |                  |
|               |         | Design, Manufacture, Supply, Installation, Testing, and Commissioning of <b>Sandwich Bus way</b> 650 volts system rising mains with cooling Fins, <b>6bar ± 3PH, 2N &amp; 1E Aluminium conductor</b> , with aluminium body/ powder coated sheet steel enclosure with 2x25x6 aluminium earth tape as earth throughout the continuous length as per specification suitable for <b>3ph 4wire 50HZ</b> , of short circuit fault withstand capacity for 1 Sec as specified below. The bus way shall have system for plug in tap off box at desired levels and single bolt double head section jointing system. Jointing system shall be with thermal sensitive temperature indicators. The Tap off boxes shall have Door Interlocking mechanism and mechanical interlocking with Bus duct housing during 'ON' position to prevent being taking of in energized condition. Supporting system shall be fail proof even in the earth quake situations, as per seismic requirement of site. |     |      |          |          |                  |                  |
| <b>Notes:</b> |         |  |     |      |          |          |                  |                  |
| 1             |         | For Rising Mains, no temperature deration upto 45°C, Ambient temperature.  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 2     |         | Flexible connections need to be included in the price and need to be provided as required for thermal expansion/ building expansion joints/ panel end connections /one vertical expansion for every floor.  |     |      |          |          |                  |                  |
| 3     |         | 200% Neutral & 100% Internal earth type Rising Main.  |     |      |          |          |                  |                  |
| 4     |         | 200% sized Neutral as of phase current.   |     |      |          |          |                  |                  |
| 3.3.1 | MR      | End flange at Panel end (if no cable adaptor box). i.e. if no incoming cable connection & Rising Main starting directly from the UPS Output Panel. (IP55)   | 2   | Nos. |          | 2,750    |                  | 5,500            |
|       |         | RISING MAIN STARTING FROM UPS OUTPUT PANEL:   |     |      |          |          |                  |                  |
| 3.3.2 | MR      | Horizontal Run  |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 200 | RM   |          | 17,923   |                  | 3,584,600        |
| 3.3.3 | MR      | Vertical Run  |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 80  | RM   |          | 17,923   |                  | 1,433,840        |
| 3.3.4 | MR      | Horizontal Expansion Joints   |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 20  | Nos. |          | 22,291   |                  | 445,820          |
| 3.3.5 | MR      | Vertical Expansion Joints   |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 8   | Nos. |          | 22,291   |                  | 178,328          |
| 3.3.6 | MR      | Vertical Bends  |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 8   | Nos. |          | 2,200    |                  | 17,600           |
| 3.3.7 | MR      | Horizontal Bends  |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 12  | Nos. |          | 2,200    |                  | 26,400           |
| 3.3.8 | MR      | Offsets   |     |      |          |          |                  |                  |
|       |         | 1000 Amp 50KA, (3P + 2N + 1E) Aluminium (IP54)  | 2   | Nos. |          | 4,400    |                  | 8,800            |
| 3.4.  | MR      | <b>TAP-OFF BOXES - INDOOR:</b>  |     |      |          |          |                  |                  |
|       |         | Supply and installation of following <b>3P MCCB ± 2N Link</b> of breaking capacity as called for, for fixing in the incoming <b>Tap-off box</b> . Tap-off box housing shall be fabricated out of 14G CRCA painted or powder coated (as approved) sheet steel. The tap-off box should be factory fabricated and complete with solid aluminium links of rated capacity from MCCB to rising mains and suitable size of gland plate etc.The tap-off box shall be suitable for termination of XLPE insulated Al. conductor armoured cable including shrouding of terminal ends. as required. |     |      |          |          |                  |                  |
| 3.4.1 | MR      | 630 Amp, <b>3P MCCB + 2N Link</b> , 35KA (with adjustable thermal release & adjustable magnetic release upto 250A & microprocessor based release beyond 250A). (IP54)   | 4   | No.  |          | 127,728  |                  | 510,912          |



| S. No         | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1             | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 3.4.2         | MR      | 200 Amp, <b>3P MCCB + 2N Link, 35KA</b> (with adjustable thermal release & adjustable magnetic release upto 250A & microprocessor based release beyond 250A). (IP54)  | 4   | No.  |          | 100,796  |                  | 403,184          |
| 3.4.3         | MR      | 100 Amp, <b>3P MCCB + 2N Link, 35KA</b> (with adjustable thermal release & adjustable magnetic release upto 250A & microprocessor based release beyond 250A). (IP54)  | 6   | No.  |          | 60,083   |                  | 360,498          |
| <b>3.5</b>    | MR      | <b>RISING MAINS - (LIGHT + POWER) INDOOR</b>  |     |      |          |          |                  |                  |
|               |         | Design, Manufacture, Supply, Installation, Testing, and Commissioning of <b>Sandwich Bus way</b> 1100 volts rising mains with cooling Fins, <b>4bar - 3P &amp; 1N, Aluminum conductor</b> with aluminium body/ powder coated sheet steel enclosure with 2x40x6 G.I. earth tape as earth throughout the continuous length, as per specification, suitable for 3ph 4wire 50HZ, of short circuit fault withstand capacity, for 1 Sec as specified below.The busway shall have a system for plug in tap off box at desired levels and single bolt double head section jointing system. The Tap off boxes shall have Door Interlocking mechanism and mechanical interlocking with Bus duct housing during 'ON' position to prevent being taking of in energized condition. Supporting system shall be fail proof even in the earth quake situations, as per seismic requirement of site. |     |      |          |          |                  |                  |
| <b>Notes:</b> |         |   |     |      |          |          |                  |                  |
| 1             |         | For Rising Mains, no temperature deration upto 45°C Ambient temperature.  |     |      |          |          |                  |                  |
| 2             |         | Flexible connections need to be included and need to be provided as required for thermal expansion/ building expansion joints/ panel end connections/ one vertical expansion for every floor.   |     |      |          |          |                  |                  |
| 3             |         | 100% sized Neutral as of phase current to be provided.  |     |      |          |          |                  |                  |
| 3.5.1         | MR      | End flange at Panel end (if no cable adaptor box). i.e. if no incoming cable connection & Rising Main starting directly from the Main LT panel/ Tower Panel. (IP55)   | 4   | Nos. |          | 4,482    |                  | 17,928           |
|               |         | RISING MAIN FROM PANEL:   |     |      |          |          |                  |                  |
| 3.5.2         | MR      | Horizontal Run<br>2000 Amp, 50KA ,4P, Aluminium (IP55)  | 200 | RM   |          | 27,054   |                  | 5,410,800        |
| 3.5.3         | MR      | Vertical Run<br>2000 Amp, 50KA ,4P, Aluminium (IP55)  | 80  | RM   |          | 27,054   |                  | 2,164,320        |
| 3.5.4         | MR      | Horizontal Expansion Joints<br>2000 Amp, 50KA ,4P, Aluminium (IP55)   | 20  | Nos. |          | 29,078   |                  | 581,560          |
| 3.5.5         | MR      | Vertical Expansion Joints   |     |      |          |          |                  |                  |

| S. No       | Code No   | Item Description  | Qty  | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|-------------|-----------|---|------|-------|----------|----------|------------------|-------------------|
| 1           | 1A        | 2   | 3    | 4     | 5        | 6        | 7                | 8                 |
|             |           | 2000 Amp, 50KA ,4P, Aluminium (IP55)  | 8    | Nos.  |          | 27,260   |                  | 218,080           |
| 3.5.6       | MR        | Vertical Bends<br>2000 Amp, 50KA ,4P, Aluminium (IP55)  | 8    | Nos.  |          | 3,586    |                  | 28,688            |
| 3.5.7       | MR        | Horizontal Bends<br>2000 Amp, 50KA ,4P, Aluminium (IP55)  | 12   | Nos.  |          | 3,586    |                  | 43,032            |
| 3.5.8       | MR        | Offsets<br>2000 Amp, 50KA ,4P, Aluminium (IP55)   | 2    | Nos.  |          | 7,171    |                  | 14,342            |
| <b>3.6.</b> | <b>MR</b> | <b>TAP-OFF BOXES - INDOOR:</b>  |      |       |          |          |                  |                   |
|             |           | Supply and installation of following <b>4P MCCB</b> of breaking capacity as called for, for fixing in the incoming <b>Tap-off box</b> . Tap-off box housing shall be fabricated out of 14G CRCA painted or powder coated (as approved) sheet steel. The tap-off box should be factory fabricated and complete with solid aluminium links of rated capacity from MCCB to rising mains and suitable size of gland plate etc.The tap-off box shall be suitable for termination of XLPE insulated Al. conductor armoured cable including shrouding of terminal ends. as required. |      |       |          |          |                  |                   |
| 3.6.1       | MR        | 400 Amp, <b>4P MCCB, 50KA</b> (with adjustable thermal & adjustable magnetic release upto 250A & microprocessor based release beyond 250A) (IP54)   | 8    | Nos.  |          | 90,804   |                  | 726,432           |
| 3.6.2       | MR        | 250 Amp, <b>4P MCCB, 35KA</b> (with adjustable thermal & adjustable magnetic release upto 250A & microprocessor based release beyond 250A) (IP54)   | 4    | Nos.  |          | 67,819   |                  | 271,276           |
| 3.6.3       | MR        | 200 Amp, <b>4P MCCB, 50KA</b> (with adjustable thermal & adjustable magnetic release upto 250A & microprocessor based release beyond 250A) (IP54)   | 16   | Nos.  |          | 71,049   |                  | 1,136,784         |
| 3.6.4       | MR        | 315 Amp, <b>4P MCCB, 35KA</b> (with adjustable thermal & adjustable magnetic release upto 250A & microprocessor based release beyond 250A) (IP54)   | 4    | Nos.  |          | 57,375   |                  | 229,500           |
|             |           |   |      |       |          |          |                  |                   |
|             |           | <b>TOTAL CARRIED OVER TO SUMMARY</b>  |      |       |          |          | <b>-</b>         | <b>24,582,040</b> |
| <b>4</b>    |           | <b>CABLE TRAYS</b>  |      |       |          |          |                  |                   |
|             |           | <b>Hot Dipped Galvanized Iron Cable Tray</b>  |      |       |          |          |                  |                   |
| 4.1         | 4.6       | Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray (galvanisation thickness not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.   |      |       |          |          |                  |                   |
| 4.1.1       | 4.6.2     | 150 mm width X 50 mm depth X 1.6 mm thickness   | 2865 | meter | 504      |          | 1,443,960        |                   |
| 4.1.2       | 4.6.4     | 300 mm width X 50 mm depth X 1.6 mm thickness   | 1230 | meter | 703      |          | 864,690          |                   |

| S. No | Code No | Item Description  | Qty  | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|------|-------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3    | 4     | 5        | 6        | 7                | 8                |
| 4.1.3 | 4.6.6   | 450 mm width X 50 mm depth X 2.0 mm thickness   | 675  | meter | 1024     |          | 691,200          |                  |
| 4.1.4 | 4.6.7   | 600 mm width X 50 mm depth X 2.0 mm thickness   | 1740 | meter | 1257     |          | 2,187,180        |                  |
| 4.1.5 | 4.6.12  | 750 mm width X 62.5 mm depth X 2.0 mm thickness   | 2055 | meter | 1582     |          | 3,251,010        |                  |
| 4.1.6 | 4.6.13  | 900 mm width X 62.5 mm depth X 2.0 mm thickness   | 180  | meter | 1846     |          | 332,280          |                  |
|       |         |   |      |       |          |          |                  |                  |
| 4.2   | 4.7     | Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "bends" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.   |      |       |          |          |                  |                  |
| 4.2.1 | 4.7.2   | 150 mm width X 50 mm depth X 1.6 mm thickness   | 109  | Each  | 976      |          | 106,384          |                  |
| 4.2.2 | 4.7.4   | 300 mm width X 50 mm depth X 1.6 mm thickness   | 28   | Each  | 1447     |          | 40,516           |                  |
| 4.2.3 | 4.7.6   | 450 mm width X 50 mm depth X 2.0 mm thickness   | 42   | Each  | 2184     |          | 91,728           |                  |
| 4.2.4 | 4.7.7   | 600 mm width X 50 mm depth X 2.0 mm thickness   | 62   | Each  | 2731     |          | 169,322          |                  |
| 4.2.5 | 4.7.12  | 750 mm width X 62.5 mm depth X 2.0 mm thickness   | 119  | Each  | 3477     |          | 413,763          |                  |
| 4.2.6 | 4.7.13  | 900 mm width X 62.5 mm depth X 2.0 mm thickness   | 18   | Each  | 4046     |          | 72,828           |                  |
|       |         |   |      |       |          |          |                  |                  |
| 4.3   | 4.8     | Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "Tee" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.   |      |       |          |          |                  |                  |
| 4.3.1 | 4.8.2   | 150 mm width X 50 mm depth X 1.6 mm thickness   | 42   | Each  | 976      |          | 40,992           |                  |
| 4.3.2 | 4.8.4   | 300 mm width X 50 mm depth X 1.6 mm thickness   | 20   | Each  | 1695     |          | 33,900           |                  |
| 4.3.3 | 4.8.6   | 450 mm width X 50 mm depth X 2.0 mm thickness   | 26   | Each  | 2576     |          | 66,976           |                  |
| 4.3.4 | 4.8.7   | 600 mm width X 50 mm depth X 2.0 mm thickness   | 44   | Each  | 3228     |          | 142,032          |                  |
| 4.3.5 | 4.8.12  | 750 mm width X 62.5 mm depth X 2.0 mm thickness   | 40   | Each  | 4104     |          | 164,160          |                  |
| 4.3.6 | 4.8.13  | 900 mm width X 62.5 mm depth X 2.0 mm thickness   | 4    | Each  | 4784     |          | 19,136           |                  |
|       |         |   |      |       |          |          |                  |                  |
| 4.4.  | MR      | <b>LADDER TYPE CABLE TRAY</b>   |      |       |          |          |                  |                  |
|       |         | Supply, fabrication and installation of pre-galvanised factory built G.I ladder type cable trays complete with all bends, tees, elbows, reducers, supports & fixing arrangement etc. of various widths in single tier/ two tier/ three tier/ five tier fashion either on one side of the wall or on two sides of the wall or at ceiling/ wall/ floor.(All bends & tee shall be of factory built of same make as that of tray). Cable tray supports are supposed to be included in the rate of the trays. Nothing extra to be paid for cable tray supports. Cable trays and supports shall be as per specifications. |      |       |          |          |                  |                  |
|       |         |   |      |       |          |          |                  |                  |
| 4.4.1 | MR      | 750mm wide tray   | 570  | RM    |          | 1,205    |                  | 686,850          |
| 4.4.2 | MR      | 1000mm wide tray  | 560  | RM    |          | 1,346    |                  | 753,760          |
| 4.4.3 | MR      | 1500mm wide tray  | 60   | RM    |          | 1,969    |                  | 118,140          |
|       |         |   |      |       |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items  | Amount NSR Items |
|-------|---------|--|------|------|----------|----------|-------------------|------------------|
| 1     | 1A      | 2  | 3    | 4    | 5        | 6        | 7                 | 8                |
| Note  |         | Contractor to ensure that cable trays and their supports are strong enough to take care of the loads of the cables without sagging and the supporting arrangement shall be safe enough to withstand earthquake situations as per seismic conditions prevailing at site. Contractor to improve upon specifications of trays and supports as specified in the specifications and BOQ, if it is felt necessary for the safety and with the approval of owner/PMC. |      |      |          |          |                   |                  |
| 4.5.  |         | <b>RACEWAY</b><br>Supply and Fixing GI raceway with Junction boxes made from <b>1.6mm thick pre-galvanized sheets for bottom and sides and complete with 2mm /3mm thick top cover</b> and with rubber gasketing and complete with junction boxes. The junction box shall be suitable to accommodate GI raceways specified above. Necessary civil work to support/ clamp from RCC slab/ walls need to be included here too.                                     |      |      |          |          |                   |                  |
| 4.5.1 | MR      | 100mm x 50mm (2mm top cover)   | 1160 | RM   |          | 616      |                   | 714,560          |
| 4.5.2 | MR      | 225mm x 50mm (2mm top cover)   | 450  | RM   |          | 940      |                   | 423,000          |
| 4.5.3 | MR      | 300mm x 50mm (3mm top cover)   | 365  | RM   |          | 1,350    |                   | 492,750          |
| 4.5.4 | MR      | 450mm x 50mm (3mm top cover)   | 560  | RM   |          | 1,846    |                   | 1,033,760        |
|       |         |  |      |      |          |          |                   |                  |
|       |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>   |      |      |          |          | <b>10,132,057</b> | <b>4,222,820</b> |
| 5     |         | <b>MCCB, MCB &amp; DB'S</b>  |      |      |          |          |                   |                  |
| 5.1   |         | Supplying and fixing of following ways surface/ recess mounting 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without MCBs and incomer) as required.   |      |      |          |          |                   |                  |
| 5.1.1 | 2.3.3   | <b>12WAY SPN DB (Without MCB and RCCB, Cost separatey considered for the Same)</b><br>DB- 12WAY SPN DB as described above.   | 36   | Each | 1151     |          | 41,436            |                  |
| 5.1.2 | MR      | <b>8WAY TPN DB (Without MCB and RCCB, Cost separatey considered for the Same)</b><br>DB- 8WAY (8+24) TPN DB as described above.  | 129  | Each |          | 4,239    |                   | 546,831          |
| 5.1.3 | MR      | <b>12WAY TPN DB (Without MCB and RCCB, Cost separatey considered for the Same)</b><br>DB- 12WAY (8+36) TPN DB as described above.  | 231  | Each |          | 6,351    |                   | 1,467,081        |

| S. No | Code No | Item Description  | Qty   | Unit | DSR Rate  | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|------|-----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3     | 4    | 5         | 6        | 7                | 8                |
| 5.2   |         | Supplying and fixing of following MCB (10KA) and RCCB's (30-300mA) on respected DB)   |       |      |           |          |                  |                  |
| 5.2.1 | 2.13.1  | 4P MCB-(40A)  | 1000  | Nos. | 667       |          | 667,000          |                  |
| 5.2.2 | 2.13.2  | 4P MCB-(63A)  | 1396  | Nos. | 678       |          | 946,488          |                  |
| 5.2.3 | 2.10.1  | SP MCB-(6A-32A)   | 15844 | Nos. | 173       |          | 2,741,012        |                  |
| 5.2.4 | 2.10.3  | DP MCB-(32A)  | 310   | Nos. | 463       |          | 143,530          | -                |
| 5.2.5 | 2.14.2  | DP RCCB-(32A)   | 36    | Nos. | 1719      |          | 61,884           |                  |
| 5.2.6 | 2.15.2  | 4P RCCB-(40A)   | 129   | Nos. | 2131      |          | 274,899          |                  |
| 5.2.7 | 2.15.3  | 4P RCCB-(63A)   | 1360  | Nos. | 2302      |          | 3,130,720        |                  |
|       |         |   |       |      |           |          |                  |                  |
| 5.3   | 2.5     | Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without MCBs and incomer) as required. (Note: Vertical type MCB TPDB is normally used where 3 phase outlets are required.) |       |      |           |          |                  |                  |
| 5.3.1 | 2.5.3   | 12 way (4 + 36), Double door  | 5     | Each | 7189      |          | 35,945           |                  |
|       |         |   |       |      |           |          | -                |                  |
| 5.4.0 |         | Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreader in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required.  |       |      |           |          | -                |                  |
| 5.4.1 | 2.2.1   | 100A, 25kA, TPMCCB  | 10    | Each | 3,218.00  |          | 32,180           |                  |
| 5.4.2 | 2.2.5   | 160A, 25kA, TPMCCB  | 4     | Each | 3,613.00  |          | 14,452           |                  |
| 5.4.3 | 2.2.5   | 200A, 25kA, TPMCCB  | 4     | Each | 7,964.00  |          | 31,856           |                  |
| 5.4.4 | 2.2.6   | 250A, 25kA, TPMCCB  | 4     | Each | 9,397.00  |          | 37,588           |                  |
| 5.4.5 | 2.2.11  | 630A, 50kA, TPMCCB  | 4     | Each | 20,234.00 |          | 80,936           |                  |
| 5.4.6 | 2.2.12  | 800A, 50kA, TPMCCB  | 4     | Each | 24,679.00 |          | 98,716           |                  |
|       |         |   |       |      |           |          | -                |                  |
| 5.5.0 | 1.22    | Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required.   |       |      |           |          | -                |                  |
| 5.5.1 | 1.22.2  | 100 mm X 100 mm X 60 mm deep  | 10    | Each | 114.00    |          | 1,140            |                  |
| 5.5.2 | 1.22.4  | 150 mm X 150 mm X 60 mm deep  | 4     | Each | 168.00    |          | 672              |                  |
| 5.5.3 | 1.22.14 | 200 mm X 300 mm X 100 mm deep   | 8     | Each | 317.00    |          | 2,536            |                  |
| 5.5.4 | 1.22.16 | 250 mm X 300 mm X 100 mm deep   | 8     | Each | 373.00    |          | 2,984            |                  |
|       |         |   |       |      |           |          |                  |                  |
|       |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>  |       |      |           |          | <b>8,345,974</b> | <b>2,013,912</b> |
| 6     |         | <b>POINT WIRING</b>   |       |      |           |          |                  |                  |
| 6.1   | 1.3     | Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper flexible conductor wires in surface / recessed medium class steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.   |       |      |           |          |                  |                  |

| S. No | Code No | Item Description  | Qty     | Unit   | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|---------|--------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3       | 4      | 5        | 6        | 7                | 8                |
| 6.1.1 | 1.3.3   | Group C   | 6223.2  | Points | 1037     |          | 6,453,458        |                  |
| 6.2   | 1.54    | Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper flexible conductor single core cable in surface/ recessed steel conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required. |         |        |          |          |                  |                  |
| 6.2.1 | 1.54.3  | Group C   | 12575.8 | Points | 601      |          | 7,558,056        |                  |
| 6.3   | 1.5     | Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit alongwith 1 No. 4 sq. mm FRLS PVC insulated copper flexible conductor single core cable for loop earthing as required.  | 22839   | Meter  | 239      |          | 5,458,521        |                  |
| 6.4   | 1.6     | Wiring for light/ power plug with 4X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit alongwith 2 Nos. 4 sq. mm FRLS PVC insulated copper flexible conductor single core cable for loop earthing as required.   | 200     | Meter  | 366      |          | 73,200           |                  |
| 6.5   | 1.7     | Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper flexible conductor, single core cable in surface/ recessed Steel conduit as required.(FOR LIGHTING CIRCUIT / SUB MAIN WIRING)   |         |        |          |          |                  |                  |
| 6.5.1 | 1.7.1   | 2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire  | 51759   | Meter  | 181      |          | 9,368,379        |                  |
| 6.5.2 | 1.7.2   | 2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire  | 89490   | Meter  | 206      |          | 18,434,940       |                  |
| 6.5.3 | 1.7.3   | 2 X 4 sq. mm + 1 X 4 sq. mm earth wire  | 98556   | Meter  | 237      |          | 23,357,772       |                  |
| 6.5.4 | 1.7.4   | 2 X 6 sq. mm + 1 X 6 sq. mm earth wire  | 8050    | Meter  | 324      |          | 2,608,200        |                  |
| 6.5.5 | 1.7.5   | 2 X 10 sq. mm + 1 X 6 sq. mm earth wire   | 200     | Meter  | 392      |          | 78,400           |                  |
| 6.5.6 | 1.7.8   | 4 X 4 sq. mm + 2 X 4 sq. mm earth wire  | 1000    | Meter  | 374      |          | 374,000          |                  |
| 6.5.7 | 1.7.9   | 4 X 6 sq. mm + 2 X 6 sq. mm earth wire  | 150     | Meter  | 518      |          | 77,700           |                  |
| 6.5.8 | 1.7.10  | 4 X 10 sq. mm + 2 X 6 sq. mm earth wire   | 2100    | Meter  | 653      |          | 1,371,300        |                  |
| 6.5.9 | 1.7.11  | 4 X 16 sq. mm + 2 X 6 sq. mm earth wire   | 3400    | Meter  | 930      |          | 3,162,000        |                  |
| 6.6   | 1.19    | Supplying and drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in the existing surface/ recessed steel/ PVC conduit as required.  | 12850   | Meter  | 29       |          | 372,650          |                  |
| 6.7   | 1.20    | Supplying and fixing of following sizes of PVC conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.  |         |        |          |          |                  |                  |
| 6.7.1 | 1.21.2  | 25 mm   | 98650   | Meter  | 69       |          | 6,806,850        |                  |

| S. No  | Code No | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|------|------|----------|----------|------------------|------------------|
| 1      | 1A      | 2  | 3    | 4    | 5        | 6        | 7                | 8                |
| 6.8    | 1.24    | Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.   |      |      |          |          |                  |                  |
| 6.8.1  | 1.24.7  | TV antenna socket outlet   | 257  | Each | 97       |          | 24,929           |                  |
| 6.9    | 1.26    | Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required.  | 76   | Each | 24       |          | 1,824            |                  |
| 6.10   | 1.27    | Supplying and fixing following size/modules, GI box along with modular base and cover plate for modular switches in recess etc as required.(For tv).   |      |      |          |          |                  |                  |
| 6.10.1 | 1.27.1  | 1 or 2 module (75mm x 75mm)  | 257  | Each | 175      |          | 44,975           |                  |
| 6.11   | 1.31    | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.                              | 5786 | Each | 313      |          | 1,811,018        |                  |
| 6.12   | MR      | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 2 Nos. 3 pin 5/6 A modular socket outlet and 1 No. 10 A (TV point) modular switch, connections etc. as required.       | 257  | Each |          | 892      |                  | 229,244          |
| 6.13   | MR      | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 2 Nos. 3 pin 5/6 A modular socket outlet and 1 No. 10 A modular switch, connections etc. as required.                  | 1346 | Each |          | 892      |                  | 1,200,632        |
| 6.14   | MR      | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 Nos. 3 pin 5/6 A (Computer point) modular socket outlet and 1 No. 10 A modular switch, connections etc. as required. | 2181 | Each |          | 1,186    |                  | 2,586,666        |
| 6.15   | 1.32    | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 A & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required.                  | 6604 | Each | 406      |          | 2,681,224        |                  |
| 6.16   | MR      | Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 2 Nos. 6 pin 5/6 A & 15/16 A modular socket outlet and 1 No. 20 A modular switch, connections etc. as required.        | 1021 | Each |          | 1,258    |                  | 1,284,418        |
| 6.17   | 1.18    | Supplying and drawing following pair 0.5 mm dia FRLS PVC insulated annealed copper conductor, unarmored telephone cable in the existing surface/ recessed steel/ PVC conduit as required.  |      |      |          |          |                  |                  |

| S. No  | Code No | Item Description  | Qty    | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|--------|-------|----------|----------|------------------|------------------|
| 1      | 1A      | 2   | 3      | 4     | 5        | 6        | 7                | 8                |
| 6.17.1 | 1.18.2  | 2 Pair  | 17045  | meter | 19       |          | 323,855          |                  |
| 6.17.2 | 1.18.3  | 4 Pair  | 2315   | meter | 28       |          | 64,820           |                  |
| 6.18   | MR      | Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed Steel/ PVC conduit as required.   | 231755 | Meter |          | 22       |                  | 5,098,610        |
| 6.19   | MR      | Indoor Telephone/ Intercom Cabling - Un. Ar. Tele Cables/ Wires   |        |       |          |          |                  |                  |
|        |         | Supply, Laying, Testing & Commissioning including termination at both ends and ferruling of following sizes of <b>0.61mm</b> dia tinned <b>copper</b> conductor, PVC insulated, sheathed, <b>unarmoured</b> telephone cables <b>in existing conduits, on existing cable trays</b> or clamping on slabs/ walls including necessary clamps, cable ties etc. and complete in all respects as required: |        |       |          |          |                  |                  |
| 6.19.1 | MR      | 100 pair cable/ 0.61mm dia  | 1435   | RM    |          | 318      |                  | 456,330          |
| 6.19.2 | MR      | 50 Pair   | 505    | RM    |          | 255      |                  | 128,775          |
| 6.19.3 | MR      | 40 Pair   | 470    | RM    |          | 246      |                  | 115,620          |
| 6.19.4 | MR      | 20 Pair   | 570    | RM    |          | 191      |                  | 108,870          |
| 6.19.5 | MR      | 10 Pair   | 1115   | RM    |          | 119      |                  | 132,685          |
| 6.20   | MR      | Outdoor Telephone/ Intercom Cabling - Jelly filled Ar. Cables   |        |       |          |          |                  |                  |
|        |         | Supply, Laying, Testing & Commissioning of following sizes of <b>0.61mm</b> dia tinned <b>copper</b> conductor, PVC insulated, sheathed, <b>Jelly filled armoured</b> telephone cables.   |        |       |          |          |                  |                  |
| 6.20.1 | MR      | 100 pair cable/ 0.61mm dia Jelly filled armoured.   | 1080   | RM    |          | 559      |                  | 603,720          |
| 6.20.2 | MR      | 200 pair cable/ 0.61mm dia Jelly filled armoured.   | 900    | RM    |          | 737      |                  | 663,300          |
| 6.21   | MR      | <b>TELEPHONE TAG BLOCK</b>  |        |       |          |          |                  |                  |
|        |         | Supply, installation, testing & commissioning of telephone tag blocks with 'KRONE" terminal connectors fixed in 16G powder coated, hinged, lockable door, sheet steel enclosure including civil work such as chase cutting, fixing/ concealing the box and making good as required including terminations:  |        |       |          |          |                  |                  |
| 6.21.1 | MR      | 100 pair tele tag block   | 5      | No.   |          | 3,593    |                  | 17,965           |
| 6.21.2 | MR      | 50 pair tele tag block  | 3      | No.   |          | 1,952    |                  | 5,856            |
| 6.21.3 | MR      | 40 pair tele tag block  | 2      | No.   |          | 1,622    |                  | 3,244            |
| 6.21.4 | MR      | 20 pair tele tag block  | 9      | No.   |          | 1,291    |                  | 11,619           |
| 6.21.5 | MR      | 10 pair tele tag block  | 14     | No.   |          | 940      |                  | 13,160           |
| 6.22   | MR      | Supply & Fixing Modular Type following Data Point / IO's with modular GI box along with modular base & face place for Data Point / IO's box including connections but excluding modular plate etc. as required:   |        |       |          |          |                  |                  |
| 6.22.1 | MR      | 1 Node  | 442    | Each  |          | 700      |                  | 309,400          |
| 6.22.2 | MR      | 2 Node  | 1203   | Each  |          | 719      |                  | 864,957          |
| 6.22.3 | MR      | 3 Node  | 1215   | Each  |          | 954      |                  | 1,159,110        |



| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 6.23  | 2.18    | Supplying and fixing 20 A, 240 V, SPN Industrial type socket outlet, with 2 pole and earth, metal enclosed plug top alongwith 20 A, "C" curve, SP, MCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required. | 148 | Each | 980      |          | 145,040          |                  |
| 6.24  | 2.19    | Supplying and fixing 20 A, 415 V, TPN Industrial type socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 20 A, "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.   | 23  | Each | 1455     |          | 33,465           |                  |
| 6.25  | MR      | Supplying and fixing 32 A, 240 V, SPN Industrial type socket outlet, with 2 pole and earth, metal enclosed plug top alongwith 32 A, "C" curve, SP, MCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required. | 4   | Each |          | 3,021    |                  | 12,084           |
| 6.26  | 2.20    | Supplying and fixing 30 A, 415 V, TPN Industrial type socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 30 A, "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.   | 2   | Each | 2488     |          | 4,976            |                  |
| 27    | MR      | Supplying and fixing 63 A, 415 V, TPN Industrial type socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 63 A, "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.   | 3   | Each |          | 4,223    |                  | 12,669           |
| 28    |         | <b><u>WIRING FOR SERVER ROOM/ HUB ROOM</u></b>  |     |      |          |          |                  |                  |
| 28.1  | MR      | Providing & Fixing of 63A <b>Socket outlets with plug top &amp; wiring with 16 sq.mm</b>  |     |      |          |          |                  |                  |
|       |         | <b>63A, 1 Phase, 230V, 3 Pin, round pin, plastic socket out let with plastic angled plug top in CRCA sheet steel powder coated metallic enclosure with 40A DP MCB, 10kA, 'D' Curve. Socket &amp; plug top with IP 44 rating &amp; metal enclosure IP30.</b>   | 24  | Nos. |          | 4,235    |                  | 101,640          |
| 28.2  | MR      | Supply & Laying of wiring in existing raceways / on existing cable trays:   |     |      |          |          |                  |                  |
|       |         | <b>4C x 16 Sq.mm</b> 450/750 Volts grade PVC insulated FR-LSH PVC sheathed flexible copper conductor cable as per IS:694 including termination at both end (P,N,G ,IG)  | 858 | RM   |          | 536      |                  | 459,888          |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items  | Amount NSR Items  |
|-----------|---------|--|-----|------|----------|----------|-------------------|-------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6        | 7                 | 8                 |
|           |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>   |     |      |          |          | <b>90,691,552</b> | <b>15,580,462</b> |
| <b>G.</b> |         | <b>UPS</b>   |     |      |          |          |                   |                   |
| <b>1</b>  |         | <b>UPS FOR AYUSH BLOCK</b>   |     |      |          |          |                   |                   |
|           |         | Supply, installation, testing & commissioning of IGBT based micro processor controlled True On line double conversion 3 phase input and 3 phase 415V output 2 X 60 <b>kVA (0.9PF)</b> Parallel Redundant UPS operating in Parallel redundant configuration <b>(N+1)</b> consisting of following: |     |      |          |          |                   |                   |
| a.        |         | Each UPS module with integrated 100% rectifier + inverter.   |     |      |          |          |                   |                   |
| b.        |         | Battery Circuit breaker for Each UPS Module in CRCA housing with all required fixing accessories & hardware.   |     |      |          |          |                   |                   |
| c.        |         | Galvanic Isolation transformer K-13, at the inverter output of Each UPS Module.  |     |      |          |          |                   |                   |
| d.        |         | RS 485 BACnet / Modbus protocol with each UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.   |     |      |          |          |                   |                   |
| e.        |         | In-built Static switch for bypass & inverter in each UPS module.   |     |      |          |          |                   |                   |
| f.        |         | In-built Manual Maintenance bypass for each UPS.   |     |      |          |          |                   |                   |
| g.        |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size for each UPS.   |     |      |          |          |                   |                   |
| h.        |         | Each UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |          |                   |                   |
| i.        |         | Sealed Maintenance free batteries for 2 X 60 <b>kVA</b> UPS with 15 Mins. backup time on each UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals.  |     |      |          |          |                   |                   |
| j.        |         | Suitable MS stand of 450mm high for each UPS module duly painted for each UPS.   |     |      |          |          |                   |                   |
| k.        |         | RAM Module with each UPS and Cat 5 cable for RAM connectivity.   |     |      |          |          |                   |                   |
| l.        |         | Charger Capacity 120%  |     |      |          |          |                   |                   |
| m.        |         | UPS to have atleast two dry contacts for remote alarms.  |     |      |          |          |                   |                   |
|           |         | <b>2X60 kVA</b> UPS described above  | 1   | Set  |          |          | 2,088,391         | 2,088,391         |
| <b>2</b>  | MR      | <b>UPS for Emergency Lighting, VAV &amp; Security Systems for IPD Block</b>  |     |      |          |          |                   |                   |
|           |         | Supply of IGBT based micro processor controlled True On line double conversion 3 Phase input 415V and 3 Phase output 2x30 <b>kVA (0.9PF)</b> UPS <b>(N)</b> consisting of following:   |     |      |          |          |                   |                   |
| a.        |         | Each UPS module with integrated 100% rectifier + inverter.   |     |      |          |          |                   |                   |
| b.        |         | Battery Circuit breaker for UPS module in CRCA housing with all required fixing accessories & hardware.  |     |      |          |          |                   |                   |

| S. No    | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A      | 2   | 3   | 4    | 5        | 6         | 7                | 8                |
| c.       |         | RS 485 BACnet/ Modbus protocol with UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.  |     |      |          |           |                  |                  |
| d.       |         | In-built static switch for bypass & inverter in UPS module.   |     |      |          |           |                  |                  |
| e.       |         | In-built Manual maintenance bypass.   |     |      |          |           |                  |                  |
| f.       |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size.   |     |      |          |           |                  |                  |
| g.       |         | UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |           |                  |                  |
| h.       |         | Sealed maintenance free batteries for 2x30 <b>KVA</b> UPS with <b>90mins.</b> backup time on UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals.  |     |      |          |           |                  |                  |
| i.       |         | Suitable MS stand of 450mm high for UPS module duly painted.  |     |      |          |           |                  |                  |
| j.       |         | RAM module with UPS and Cat 5 cable for RAM connectivity.   |     |      |          |           |                  |                  |
| k.       |         | Charger Capacity 120%   |     |      |          |           |                  |                  |
| l.       |         | UPS to have atleast two dry contacts for remote alarms.   |     |      |          |           |                  |                  |
|          |         | <b>2 x 30 KVA</b> UPS described above.  | 1   | Set  |          | 1,794,284 |                  | 1,794,284        |
| <b>3</b> | MR      | <b>UPS for Emergency Lighting, VAV &amp; Security Systems for Ayush Block</b>   |     |      |          |           |                  |                  |
|          |         | Supply of IGBT based micro processor controlled True On line double conversion 3 Phase input 415V and 3 Phase output 1X 10 <b>KVA (0.9PF) UPS (N)</b> consisting of following:                                      |     |      |          |           |                  |                  |
| a.       |         | Each UPS module with integrated 100% rectifier + inverter.  |     |      |          |           |                  |                  |
| b.       |         | Battery Circuit breaker for UPS module in CRCA housing with all required fixing accessories & hardware.   |     |      |          |           |                  |                  |
| c.       |         | RS 485 BACnet / Modbus protocol with UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.   |     |      |          |           |                  |                  |
| d.       |         | In-built static switch for bypass & inverter in UPS module.   |     |      |          |           |                  |                  |
| e.       |         | In-built Manual maintenance bypass.   |     |      |          |           |                  |                  |
| f.       |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size.   |     |      |          |           |                  |                  |
| g.       |         | UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |           |                  |                  |
| h.       |         | Sealed maintenance free batteries for 1 x10 <b>KVA</b> UPS with <b>90mins.</b> backup time on UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals. |     |      |          |           |                  |                  |
| i.       |         | Suitable MS stand of 450mm high for UPS module duly painted.  |     |      |          |           |                  |                  |
| j.       |         | RAM module with UPS and Cat 5 cable for RAM connectivity.   |     |      |          |           |                  |                  |
| k.       |         | Charger Capacity 120%   |     |      |          |           |                  |                  |
| l.       |         | UPS to have atleast two dry contacts for remote alarms.   |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
|       |         | 1 x 10 KVA UPS described above.  | 1   | Set  |          | 238,408   |                  | 238,408          |
| 4     | MR      | <b>UPS</b>   |     |      |          |           |                  |                  |
|       |         | Supply, installation, testing & commissioning of IGBT based micro processor controlled True On line double conversion 3 phase input and 3 phase 415V output 2 X 30 <b>kVA (0.9PF)</b> Parallel Redundant UPS operating in Parallel redundant configuration <b>(N+1)</b> consisting of following: |     |      |          |           |                  |                  |
| a.    |         | Each UPS module with integrated 100% rectifier + inverter.   |     |      |          |           |                  |                  |
| b.    |         | Battery Circuit breaker for Each UPS Module in CRCA housing with all required fixing accessories & hardware.   |     |      |          |           |                  |                  |
| c.    |         | Galvanic Isolation transformer K-13, at the inverter output of Each UPS Module.  |     |      |          |           |                  |                  |
| d.    |         | RS 485 BACnet / Modbus protocol with each UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.   |     |      |          |           |                  |                  |
| e.    |         | In-built Static switch for bypass & inverter in each UPS module.   |     |      |          |           |                  |                  |
| f.    |         | In-built Manual Maintenance bypass for each UPS.   |     |      |          |           |                  |                  |
| g.    |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size for each UPS.   |     |      |          |           |                  |                  |
| h.    |         | Each UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |           |                  |                  |
| i.    |         | Sealed Maintenance free batteries for 2 X 30 <b>kVA</b> UPS with 15 <u>Mins.</u> backup time on each UPS module with interconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals.  |     |      |          |           |                  |                  |
| j.    |         | Suitable MS stand of 450mm high for each UPS module duly painted for each UPS.   |     |      |          |           |                  |                  |
| k.    |         | RAM Module with each UPS and Cat 5 cable for RAM connectivity.   |     |      |          |           |                  |                  |
| l.    |         | Charger Capacity 120%  |     |      |          |           |                  |                  |
| m.    |         | UPS to have atleast two dry contacts for remote alarms.  |     |      |          |           |                  |                  |
|       |         | <b>2X30 kVA</b> UPS described above  | 3   | Set  |          | 1,269,855 |                  | 3,809,565        |
| 5     | MR      | <b>UPS</b>   |     |      |          |           |                  |                  |
|       |         | Supply, installation, testing & commissioning of IGBT based micro processor controlled True On line double conversion 3 phase input and 3 phase 415V output 2 X 10 <b>kVA (0.9PF)</b> Parallel Redundant UPS operating in Parallel redundant configuration <b>(N+1)</b> consisting of following: |     |      |          |           |                  |                  |
| a.    |         | Each UPS module with integrated 100% rectifier + inverter.   |     |      |          |           |                  |                  |
| b.    |         | Battery Circuit breaker for Each UPS Module in CRCA housing with all required fixing accessories & hardware.   |     |      |          |           |                  |                  |
| c.    |         | Galvanic Isolation transformer K-13, at the inverter output of Each UPS Module.  |     |      |          |           |                  |                  |

| S. No    | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1        | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| d.       |         | RS 485 BACnet / Modbus protocol with each UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.   |     |      |          |          |                  |                  |
| e.       |         | In-built Static switch for bypass & inverter in each UPS module.   |     |      |          |          |                  |                  |
| f.       |         | In-built Manual Maintenance bypass for each UPS.   |     |      |          |          |                  |                  |
| g.       |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size for each UPS.   |     |      |          |          |                  |                  |
| h.       |         | Each UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |          |                  |                  |
| i.       |         | Sealed Maintenance free batteries for 2 X 10 <b>kVA</b> UPS with 15 <u>Mins.</u> backup time on each UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals. |     |      |          |          |                  |                  |
| j.       |         | Suitable MS stand of 450mm high for each UPS module duly painted for each UPS.   |     |      |          |          |                  |                  |
| k.       |         | RAM Module with each UPS and Cat 5 cable for RAM connectivity.   |     |      |          |          |                  |                  |
| l.       |         | Charger Capacity 120%  |     |      |          |          |                  |                  |
| m.       |         | UPS to have atleast two dry contacts for remote alarms.  |     |      |          |          |                  |                  |
|          |         | <b>2X10 kVA</b> UPS described above  | 1   | Set  |          | 432,116  |                  | 432,116          |
| <b>6</b> | MR      | <b>UPS for Emergency Lighting, VAV &amp; Security Systems</b>  |     |      |          |          |                  |                  |
|          |         | Supply of IGBT based micro processor controlled True On line double conversion 3 Phase input 415V and 3 Phase output 1X 10 <b>KVA (0.9PF)</b> UPS ( <b>N</b> ) consisting of following:                                    |     |      |          |          |                  |                  |
| a.       |         | Each UPS module with integrated 100% rectifier + inverter.   |     |      |          |          |                  |                  |
| b.       |         | Battery Circuit breaker for UPS module in CRCA housing with all required fixing accessories & hardware.  |     |      |          |          |                  |                  |
| c.       |         | RS 485 BACnet / Modbus protocol with UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.  |     |      |          |          |                  |                  |
| d.       |         | In-built static switch for bypass & inverter in UPS module.  |     |      |          |          |                  |                  |
| e.       |         | In-built Manual maintenance bypass.  |     |      |          |          |                  |                  |
| f.       |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size.  |     |      |          |          |                  |                  |
| g.       |         | UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.   |     |      |          |          |                  |                  |
| h.       |         | Sealed maintenance free batteries for 1 x10 <b>KVA</b> UPS with <b>90mins.</b> backup time on UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals.        |     |      |          |          |                  |                  |
| i.       |         | Suitable MS stand of 450mm high for UPS module duly painted.   |     |      |          |          |                  |                  |
| j.       |         | RAM module with UPS and Cat 5 cable for RAM connectivity.  |     |      |          |          |                  |                  |
| k.       |         | Charger Capacity 120%  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|-------|---------|---|-----|------|----------|----------|------------------|-------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                 |
| I.    |         | UPS to have atleast two dry contacts for remote alarms.<br>1 x 10 KVA UPS described above.  | 5   | Set  |          | 301,255  |                  | 1,506,275         |
| 7     | MR      | <b>UPS for Emergency Lighting, VAV &amp; Security Systems</b>   |     |      |          |          |                  |                   |
|       |         | Supply of IGBT based micro processor controlled True On line double conversion 3 Phase input 415V and 3 Phase output 1X 15 <b>KVA (0.9PF) UPS (N)</b> consisting of following:                                      |     |      |          |          |                  |                   |
| a.    |         | Each UPS module with integrated 100% rectifier + inverter.  |     |      |          |          |                  |                   |
| b.    |         | Battery Circuit breaker for UPS module in CRCA housing with all required fixing accessories & hardware.   |     |      |          |          |                  |                   |
| c.    |         | RS 485 BACnet / Modbus protocol with UPS module for BMS Connectivity. All the informations to be provided to the BMS vendor at one point.   |     |      |          |          |                  |                   |
| d.    |         | In-built static switch for bypass & inverter in UPS module.   |     |      |          |          |                  |                   |
| e.    |         | In-built Manual maintenance bypass.   |     |      |          |          |                  |                   |
| f.    |         | Interconnecting copper cabling (DC cabling) between UPS, Battery breaker & Batteries of required length and size.   |     |      |          |          |                  |                   |
| g.    |         | UPS shall have a SNMP card for LAN/WEB connectivity. The SNMP card shall have an inbuilt memory for event logging.  |     |      |          |          |                  |                   |
| h.    |         | Sealed maintenance free batteries for 1 x15 <b>KVA</b> UPS with <b>90mins.</b> backup time on UPS module with inerconnectors, Rack and accessories. Rack shall have shrouds for safety from live battery terminals. |     |      |          |          |                  |                   |
| i.    |         | Suitable MS stand of 450mm high for UPS module duly painted.  |     |      |          |          |                  |                   |
| j.    |         | RAM module with UPS and Cat 5 cable for RAM connectivity.   |     |      |          |          |                  |                   |
| k.    |         | Charger Capacity 120%   |     |      |          |          |                  |                   |
| l.    |         | UPS to have atleast two dry contacts for remote alarms.<br>1 x 15 KVA UPS described above.  | 2   | Set  |          | 448,571  |                  | 897,142           |
|       |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>  |     |      |          |          | <b>-</b>         | <b>10,766,181</b> |
| H.    |         | <b>LIGHT FIXTURES AND FANS</b>  |     |      |          |          |                  |                   |
| Notes |         |   |     |      |          |          |                  |                   |
| :     |         |   |     |      |          |          |                  |                   |
| a.    |         | It shall include all lighting fixtures complete with lamps, control gear, power factor improvement capacitor.   |     |      |          |          |                  |                   |
| b.    |         | All the lighting fixtures and fans samples must be gotten approved from the Owner/ Architect/ PMC before ordering on the Sub-vendor and before supply.  |     |      |          |          |                  |                   |
| c.    |         | All the ceiling fans shall be complete with down rods of required length. The colour and shade of fans shall be gotten approved by the Owner / Architect / PMC.   |     |      |          |          |                  |                   |
| d.    |         | All Exhaust fans shall be complete with mounting frames, colour and shade shall be gotten approved from Owner/ Architect/ PMC.  |     |      |          |          |                  |                   |
| e.    |         | All the fixtures/ fans shall be of good quality and technically safe as per approved standard and codes.  |     |      |          |          |                  |                   |

| S. No | Code No | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3    | 4    | 5        | 6        | 7                | 8                |
| f.    |         | Colour rendering index of lamps to be decided by the architect/client.   |      |      |          |          |                  |                  |
| g.    |         | Cost shall include Factory Visit of 3 Personnel including consultant to manufacturer's overseas plant/factory in Europe/USA for inspection of items at work.                                     |      |      |          |          |                  |                  |
|       |         | <b><u>Design, Supply, Installation, Testing &amp; Commissioning of following light fixtures:</u></b>   |      |      |          |          |                  |                  |
| 1     | MR      | 30 Watt 2' x2' grid type recess mounted bottom opening clean room LED luminaire IP-54 system efficacy 2550 lumens. CAT No. : Wipro LC20-411-XXX-57-XX or equivalent. (With Dimmable ballast)     | 280  | Nos. |          | 3,308    |                  | 926,240          |
| 2     | MR      | 30 Watt 2' x2' grid type recess mounted bottom opening clean room LED luminaire IP-54 system efficacy 2550 lumens. CAT No. : Wipro LC20-411-XXX-57-XX or equivalent. (With Non Dimmable ballast) | 112  | Nos. |          | 8,999    |                  | 1,007,888        |
| 3     | MR      | 31 Watt 2' x2' grid type recess LED luminaire with full diffuser system efficacy 3100 lumens. CAT No. : Wipro CRC010R036HP57G1 or equivalent. (With Dimmable ballast)                            | 325  | Nos. |          | 5,558    |                  | 1,806,350        |
| 4     | MR      | 31 Watt 2' x2' grid type recess LED luminaire with full diffuser system efficacy 3100 lumens. CAT No. : Wipro CRC010R036HP57G1 or equivalent. (With Non Dimmable ballast)                        | 2404 | Nos. |          | 3,308    |                  | 7,952,432        |
| 5     | MR      | 31 Watt 650 mm long wall mounted personal LED luminaire for patient bed system efficacy 3100 lumens. CAT No. : Wipro LW04-411-XXX-56-XX or equivalent.(With Dimmable ballast)                    | 6    | Nos. |          | 1,257    |                  | 7,542            |
| 6     | MR      | 31 Watt 650 mm long wall mounted personal LED luminaire for patient bed system efficacy 3100 lumens. CAT No. : Wipro LW04-411-XXX-56-XX or equivalent.(With Non Dimmable ballast)                | 1105 | Nos. |          | 1,191    |                  | 1,316,055        |
| 7     | MR      | 18 Watt high performance recess mounted LED down lighter system efficacy 1710 lumens. CAT No. : Wipro LD90-231-XXX-65-XX or equivalent. (With Dimmable ballast)                                  | 94   | Nos. |          | 5,293    |                  | 497,542          |
| 8     | MR      | 18 Watt high performance recess mounted LED down lighter system efficacy 1710 lumens. CAT No. : Wipro LD90-231-XXX-65-XX or equivalent. (With Non Dimmable ballast)                              | 8769 | Nos. |          | 2,157    |                  | 18,914,733       |
| 9     | MR      | 3 Watt Brick Type foot light with louvers. (With Non Dimmable ballast)   | 42   | Nos. |          | 1,456    |                  | 61,152           |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 11    | MR      | 35 Watt High-Power Surface mounted circular LED Luminaire, 100 Lumen/Watt (With Non Dimmable ballast)  | 134 | Nos. |          | 5,161    |                  | 691,574          |
| 12    | MR      | Supply, Installation, Testing & Commissioning of LED Based LED Bulkhead with High Pressure Die Cast Aluminium Body provided with Polycarbonate cover, System Lumen Package of 700 lm and a maximum System Wattage of 9 Watts, Color Temperature of 6500K, Power Factor >0.9 with THD<20%, Ingress Protection Rating of IP65 and IK Rating of IK09, Operating Voltage Range of 90-300V AC, equivalent reports to be submitted for verify above parameters. MakeSyska Cat Ref: SSK-BH-9W or approved equivalent from list of Makes (With Non Dimmable ballast)   | 212 | Nos. |          | 993      |                  | 210,516          |
| 13    | MR      | Supply, installing, testing, storing & commissioning LED batten light fitting complete 18w watts, 1200mm long with ABS body system Lumen Efficacy ≥90 Lm/W operating Voltage between 90-300Vac, Power Factor more than 0.90%, THD less than 20%, CRI more than 80%, Luminaire intergal driver constant current constant voltage with 2KV surge protection, Over Load Protection, No Load Protection), Over all electrical efficiency more than 90%, Driver electrical efficiency will be > 85% . equivalent reports to be submitted for verify above parameters Similar to Make Syska Cat Ref: SSK-SQ1801-18W. or approved equivalent from list of Makes (With Non Dimmable ballast) | 33  | Nos. |          | 556      |                  | 18,348           |
| 14    | MR      | Supply, installing, testing, storing & commissioning LED T8 TUBE light fitting complete 22w watts, 1200mm long with PC body system Lumen Efficacy ≥120 Lm/W operating Voltage between 90-300Vac, Power Factor more than 0.90%, THD less than 15%, CRI more than 80%, Luminaire intergal driver with 2KV surge protection, Over all electrical efficiency more than 90%, Driver electrical efficiency will be > 85% . equivalent reports to be submitted for verify above parameters Similar to Make Syska Cat Ref: SSK-SSK-TL-22W-HD-I. (With Dimmable ballast)  | 76  | Nos. |          | 1,059    |                  | 80,484           |
| 15    | MR      | Supply, installing, testing, storing & commissioning LED T8 TUBE light fitting complete 22w watts, 1200mm long with PC body system Lumen Efficacy ≥120 Lm/W operating Voltage between 90-300Vac, Power Factor more than 0.90%, THD less than 15%, CRI more than 80%, Luminaire intergal driver with 2KV surge protection, Over all electrical efficiency more than 90%, Driver electrical efficiency will be > 85% . equivalent reports to be submitted for verify above parameters Similar to Make Syska Cat Ref: SSK-SSK-TL-22W-HD-I. or approved equivalent from list of Makes (With Non Dimmable ballast)  | 292 | Nos. |          | 556      |                  | 162,352          |



| S. No | Code No | Item Description  | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3    | 4    | 5        | 6        | 7                | 8                |
| 16    | MR      | Supply, Installation, Testing , storing & Commissioning of 2' x 2' recessed Light. Make Trilux : Enterio IND M73 OA LED 3600 840 ETDD/ENDO/XAL or approved equivalent from list of Makes ( With Dimmable Ballast)     | 336  | Nos. |          | 5,558    |                  | 1,867,488        |
| 17    | MR      | Supply, Installation, Testing , storing & Commissioning of 2' x 2' recessed Light. Make Trilux : Enterio IND M73 OA LED 3600 840 ETDD/ENDO/XAL or approved equivalent from list of Makes ( With Non Dimmable Ballast) | 846  | Nos. |          | 3,308    |                  | 2,798,568        |
| 18    | MR      | Supply, Installation, , storing ,Testing & Commissioning of 18 Watt recessed LED down lighter. Make Trilux : AMBIELLA PLUS IND G3 LED 1530/840 ETDD/ENDO//XAL ( With Dimmable Ballast)                                | 913  | Nos. |          | 5,293    |                  | 4,832,509        |
| 19    | MR      | Supply, Installation, , storing ,Testing & Commissioning of 18 Watt recessed LED down lighter. Make Trilux : AMBIELLA PLUS IND G3 LED 1530/840 ETDD/ENDO//XAL ( With Non Dimmable Ballast)                            | 1773 | Nos. |          | 2,157    |                  | 3,824,361        |
| 20    | MR      | Supply, Installation, storing, Testing & Commissioning of 36 Watt LED light with Batten -IP-65. Make Trilux : TRL OTA 3600 860 ETDD/ENDO/XAL. or approved equivalent from list of Makes ( With Dimmable Ballast)      | 6    | Nos. |          | 3,308    |                  | 19,848           |
| 21    | MR      | Supply, Installation, storing, Testing & Commissioning of 36 Watt LED light with Batten -IP-65. Make Trilux : TRL OTA 3600 860 ETDD/ENDO/XAL. or approved equivalent from list of Makes ( With Non Dimmable Ballast)  | 298  | Nos. |          | 3,308    |                  | 985,784          |
| 22    | MR      | Supply, Installation, storing, Testing & Commissioning of 28 Watt LED Channel light Make Trilux : LCL H 1200 OTA 52 LED 2600-840 ETDD 02 ( With Dimmable Ballast)   | 141  | Nos. |          | 2,911    |                  | 410,451          |
| 23    | MR      | Supply, Installation, storing, Testing & Commissioning of 28 Watt LED Channel light Make Trilux : LCL H 1200 OTA 52 LED 2600-840 ETDD 02 ( With Non Dimmable Ballast)   | 1214 | Nos. |          | 2,911    |                  | 3,533,954        |
| 24    | MR      | Supply, Installation, storing, Testing & Commissioning of 9 Watt LED recessed spot light Make Trilux : SNCPOINT 905 C01 BR-FL LED1100-830 01 or approved equivalent from list of Makes ( With Non Dimmable Ballast)   | 790  | Nos. |          | 4,632    |                  | 3,659,280        |
| 25    | MR      | Supply, Installation, storing, Testing & Commissioning of 14 Watt LED recessed spot light Make Trilux : SNCPOINT 905 C02 BR-FL LED1100-830 01 or approved equivalent from list of Makes ( With Dimmable Ballast)      | 210  | Nos. |          | 4,632    |                  | 972,720          |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 26    | MR      | Supply, Installation, storing, Testing & Commissioning of 14 Watt LED recessed spot light Make Trilux : SNCPOINT 905 C02 BR-FL LED1100-830 01 or approved equivalent from list of Makes ( With Non Dimmable Ballast)   | 260 | Nos. |          | 5,558    |                  | 1,445,080        |
| 27    | MR      | Supply, Installation, storing, Testing & Commissioning of 15 Watt LED recessed DOWN LIGHTER Make Trilux : AMBIELLA PLUS IND G3 LED 1275-840 ETDD or approved equivalent from list of Makes ( With Non Dimmable Ballast)  | 131 | Nos. |          | 1,959    |                  | 256,629          |
| 28    | MR      | Supply, Installation, storing, Testing & Commissioning of 39 Watt round LED recessed DOWN LIGHTER Make Trilux : INPERIAL G2 C07 BR22 3800 840 ETDD 01 or approved equivalent from list of Makes ( With Non Dimmable Ballast)   | 80  | Nos. |          | 5,690    |                  | 455,200          |
| 29    | MR      | Supply, Installation, storing, Testing & Commissioning of 48 Watt round LED recessed DOWN LIGHTER Make Trilux : INPERIAL G2 C07 BR25 4700 840 ETDD 03 or approved equivalent from list of Makes ( With Non Dimmable Ballast)   | 60  | Nos. |          | 5,690    |                  | 341,400          |
| 30    | MR      | Supply, Installation, Testing & Commissioning of LED Based LED Bulkhead with High Pressure Die Cast Aluminium Body provided with Polycarbonate cover, System Lumen Package of 700 lm and a maximum System Wattage of 9 Watts, Color Temperature of 6500K, Power Factor >0.9 with THD<20%, Ingress Protection Rating of IP65 and IK Rating of IK09, Operating Voltage Range of 90-300V AC, equivalent reports to be submitted for verify above parameters. MakeSyska Cat Ref: SSK-BH-9W or approved equivalent from list of Makes | 36  | Nos. |          | 993      |                  | 35,748           |
| 31    | MR      | Supply, Installation, Testing , storing & Commissioning of 2' x 2' IP 54 recessed Light. Make Trilux : Enterio IND M73 OA LED 3600 840 ETDD/ENDO/XAL or approved equivalent from list of Makes ( With Non Dimmable Ballast)  | 58  | Nos. |          | 3,308    |                  | 191,864          |
| 32    | MR      | Supply and fixing Ceiling Fans of ISI marked, BEE 5-star rated with necessary down rods complete as required:<br>1200mm dia sweep  | 168 | Nos. |          | 2,147    |                  | 360,696          |
| 32    | MR      | Supply and fixing of exhaust fan suitable for single phase 230 volts, 50 Hz., AC supply complete with motor, louvers/shutters etc. complete as required.   |     |      |          |          |                  |                  |
| 32.1  |         | 1380 RPM, 300 mm (Crompton Greaves Trans Air or approved equivalent)   | 130 | Nos. |          | 1,728    |                  | 224,640          |
| 32.2  | MR      | Supply of 1250 RPM, 250 mm (Crompton Greaves Brisk Air or approved equivalent) exhaust fan suitable for single phase 230 volts, 50 Hz., AC supply complete with motor, louvers/shutters etc. complete as required.   | 100 | Nos. |          | 1,766    |                  | 176,600          |

| S. No                                | Code No | Item Description  | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|--------------------------------------|---------|---|------|------|----------|----------|------------------|-------------------|
| 1                                    | 1A      | 2   | 3    | 4    | 5        | 6        | 7                | 8                 |
| 32.3                                 | MR      | Supply and fixing of 400 mm sweep, Crompton greaves model high flow 16" wall mounted fan complete with double ball bearing, motor, blades, capacitor etc suitable for single phase 230 volts, 50 Hz., AC supply, complete as required.                      | 26   | Nos. |          | 1,454    |                  | 37,804            |
| 33                                   | MR      | <b>Exit Signs</b><br>Supply, testing, storing & comisioning 'TEKNOWARE' make or approved equivalent from list of Makes DUAL SIDED, 3 Watt LED, FIRE Exit luminaires complete in all respect.  | 408  | Nos. |          | 3,636    |                  | 1,483,488         |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |         |   |      |      |          |          | -                | <b>61,567,320</b> |
| <b>I.</b>                            |         | <b>LIGHTING CONTROLS</b>  |      |      |          |          |                  |                   |
| 1                                    | MR      | PIR (Motion sensor for lighting control suitable for 4mtr. Hright) Schneider make,CAT NO.IS 3360 or approved equivalent from list of Makes  | 2733 | Each |          | 5,635    |                  | 15,400,455        |
| 2                                    | MR      | High frequency Motion sensor for lighting control Schneider make,CAT NO.HF 360 or approved equivalent from list of Makes  | 941  | Each |          | 5,635    |                  | 5,302,535         |
| 3                                    | MR      | High frequency day light sensor + Motion sensor for lighting control Schneider make,CAT NO.HF 360 or approved equivalent from list of Makes   | 584  | Each |          | 5,635    |                  | 3,290,840         |
| 4                                    | MR      | Four gang plus keypad Schneider make,CAT NO.HF 360 or approved equivalent from list of Makes  | 47   | Each |          | 10,931   |                  | 513,757           |
| 5                                    | MR      | Room lighting controls with Lyneo slide-to-off dimmer with maximum 500Watts load, Similar to Make Lutron as LyneoTM slide dimmer. or approved equivalent from list of Makes (For each ICU bed)  | 250  | Each |          | 6,021    |                  | 1,505,250         |
|                                      | Note    | Dali gateways,switch actuator,router,KNX power supply ,control cable, space Lynk/ Logical controller should be part of lighting automation system & same should be considered by tenderer/ Vendor.  |      |      |          |          |                  |                   |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |         |   |      |      |          |          | -                | <b>26,012,837</b> |
| <b>J.</b>                            |         | <b>EARTHING</b>   |      |      |          |          |                  |                   |
| 1                                    | 5.5     | Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. (but without charcoal/ coke and salt) as required. | 44   | Set  | 7546     |          | 332,024          |                   |

| S. No | Code No | Item Description   | Qty  | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|------|-------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3    | 4     | 5        | 6        | 7                | 8                |
| 2     | MR      | <p>Providing copper bonded steel rod Earth Station, with 25 mm dia. 3000 mm long copper coated steel solid rod (Cu coating shall be of &gt;250Microns) tested and certified according to IEC 62561-2. earth rods shall be provided with universal clamp (Stainless steel) to make interconnection. The rod is installed in a hole with dia of 100 mm minimum. The hole need to be filled with conductive cement based earth conductivity enhancing compound certified and confirming to IEC 62561 and TCLP tested. The above arrangements shall be provided with Heavy duty earth champer of 5000kg load bearing capacity to ensure the safety of earthing system.</p> <p>1.25mm dia,3000mm L Cu bonded steel rod<br/> 2.Earth conductivity enhancing compound(25Kg/Pit ).<br/> 3.Universal clamp(stainless steel)<br/> 4.Earth chamfer.</p> | 37   | Set   |          | 21,003   |                  | 777,111          |
| 3     | MR      | Providing and fixing 32 mm X 6 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.  | 2050 | meter |          | 406      |                  | 832,300          |
| 4     | 5.15    | Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.   | 1038 | meter | 129      |          | 133,902          |                  |
| 5     | MR      | Providing and fixing 32 mm X 6 mm G.I. strip on surface or in recess for connections etc. as required.   | 130  | meter |          | 150      |                  | 19,500           |
| 6     | 5.16    | Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.  | 3140 | meter | 37       |          | 116,180          |                  |
| 7     | 5.20    | Providing and fixing earth bus of 50 mm X 5 mm copper strip on surface for connections etc. as required.   | 780  | meter | 1283     |          | 1,000,740        |                  |
| 9     | 5.10    | Providing and fixing 25 mm X 5 mm copper strip in 40 mm dia G.I. pipe from earth electrode including connection with brass nut, bolt, spring, washer excavation and re-filling etc. as required.   | 130  | meter | 872      |          | 113,360          |                  |
| 10    | MR      | <u>SINGLE CORE COPPER UNARMoured CABLE EARTHING:</u>   |      |       |          |          |                  |                  |
|       |         | Supply and laying of 1.1kV grade PVC insulated, unsheathed, stranded copper conductor unarmoured cable (IS:694) in existing PVC pipes/ on existing cable trays etc. including terminations:  |      |       |          |          |                  |                  |
| 10.1  | MR      | 1Cx120sq.mm PVC insulated copper conductor armoured cable.   | 547  | RM    |          | 1,133    |                  | 619,751          |
| 10.2  | MR      | 1Cx50 sq.mm PVC insulated copper conductor unarmoured cable.   | 803  | RM    |          | 462      |                  | 370,986          |
| 10.3  | MR      | 1Cx6sq.mm PVC insulated copper conductor unarmoured cable.   | 740  | RM    |          | 77       |                  | 56,980           |

| S. No                                | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------------------------------|---|---|-----|------|----------|----------|------------------|------------------|
| 1                                    | 1A  | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 11                                   | MR  | Providing chemical electrode earthing stations for body and for equipment earthing consisting of<br>a) Excavation in all type of soils<br>b) 25MM dia rod<br>i) Length : 3000mm<br>ii) Terminal hole :14mm<br>iii)Galvanization : 80-100micron outer electrode<br>c) Backfilling with special compound mixed with soil.<br>d) Brick masonry chamber with Heavy duty FRP frame and hinged covers.  | 78  | Set  |          | 14,898   |                  | 1,162,044        |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |   |   |     |      |          |          | <b>1,696,206</b> | <b>3,838,672</b> |
| <b>K.</b>                            | <b>NURSE CALL SYSTEM</b>                                |   |     |      |          |          |                  |                  |
|                                      | Products shall have certified/ approved by VDE 0834/ UL |   |     |      |          |          |                  |                  |
| 1                                    | MR  | <b>Supply, Installation, Testing &amp; Commissioning of System Switch:</b>  |     |      |          |          |                  |                  |
|                                      |   | The system switch forms a decentralised communications node for exchanging data between the connected system devices and the rest of the communications system, consisting of :<br>- 1 x RJ45 socket, 100Mb IP Port (IEEE802.3 100BaseTX), galvanically isolated conforming to <b>EN 60950 and VDE 0834</b> ;<br>- 7 x RJ45 sockets, each for a 100Mb IP system port (IEEE802.3 100BaseTX) for connecting all IP capable system modules;<br>- 1 x RJ45 socket, 100Mb IP Port (IEEE802.3 100BaseTX) for connecting communications, staff and ward terminals as well as control panel PCs or for <b>redundant Connection</b> .<br>- Control LEDs for indicating the current operating state;<br>- 2 x RJ45 sockets for connection of the external data bus;<br>- All IP system modules are supplied with power using Power over LAN technology; | 64  | Nos. |          | 29,855   |                  | 1,910,720        |
| 2                                    | MR  | <b>Supply, Installation, Testing &amp; Commissioning of Nurse Station Terminal:</b>   |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | Nurse Station shall comprises of 5.6" LC colour graphic display for displaying all details , a smash proof glass panel (to protect the sensitive display from unnecessary contact during cleaning and other processes) , 12 interactive function keys for operating the system, Querying receiver for speaking discretely, Microphone and loudspeaker for hands-free speech (incl. volume control), automatic changeover between hands-free and discrete speaking , Electronic circuit board with controller and FlashProm, 100BaseTX interface to the system switch, PC interface to the communications control panel , 2.8m connection cable with an RJ45 connection plug, which is protected, from disconnection, for connecting to a connection module . The ward terminal shall display date and time, indication of all presence, all set remindedrs, indication of all calls in accordance with VDE0834. All call indications follow the priority and must display the exact location of the calls. The ward terminal shall be provided along with suitable connection module & back box. | 55  | Nos. |          | 90,499   |                  | 4,977,445        |
| 3     | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Patient/Consulatnt Handset - Without Speech</b>  |     |      |          |          |                  |                  |
|       |         | consisting of a plastic case in antimicrobial finish having<br>- Call button with nurse symbol with integrated finder and reassurance light on the top end of the unit,<br>- Membrane keypad in antimicrobial finish with integrated LEDS for operation, consisting of:<br>- 1 call key,<br>- 2 lighting keys<br>- 2.80 metre connection cable with auto-disconnecting RJ45 connector plug.<br>It shall be supplied with cradel for holding patient terminals.   | 991 | Nos. |          | 2,414    |                  | 2,392,274        |
| 4     | MR      | <b>Supply, Installation, Testing &amp; Commissioning of connection module for Patient Terminal</b>   |     |      |          |          |                  |                  |
|       |         | Connection module for patient handset shall consist of:<br>- 1 x RJ45 socket marked in colour and with measures to ensure that the push button is correctly connected, including auto disconnect mechanism,<br>- 1 membrane keypad with:<br>- 1 call button (red with nurse symbol) including a finder/reassurance light,<br>- 1 presence key/ cancel button (green) including a control LED,  | 991 | Nos. |          | 5,212    |                  | 5,165,092        |
| 5     | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Patient Handset - With Speech</b>  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | <p>For operation by patients from their beds to carry out the functions listed below, with the following characteristics:</p> <ul style="list-style-type: none"> <li>- Nurse call with possibility for communications.</li> <li>- Service call with possibility for communications.</li> <li>- Additional calls via service call key (optional) with possibility for communications.</li> <li>- Integrated IP telephone end device (H.323 or SIP protocol stack)</li> <li>- Controlling two independent lighting circuits.</li> <li>- Controlling electronically driven shutters or other environmental applications.</li> <li>- Automatic volume switching when using the PAT in the cradle.</li> <li>- Plastic case and membrane keypad in fungicidal material.</li> <li>- Splash resistant case, consisting of: <ul style="list-style-type: none"> <li>- Call button with nurse symbol with integrated finder and reassurance light on the top end of the unit.</li> <li>- Loudspeaker, microphone, headphones socket.</li> </ul> </li> <li>- A fully-graphical display with a resolution of 128 x 64 pixels.</li> <li>- 2.80 m connection cable with a RJ45 plug which is protected against disconnection.</li> </ul> | 151 | Nos. |          | 15,311   |                  | 2,311,961        |
| 6     | MR      | <p><b>Supply, Installation, Testing &amp; Commissioning of Patient/Consultant Handset - Without Speech</b></p> <p>consisting of a plastic case in antimicrobial finish having</p> <ul style="list-style-type: none"> <li>- Call button with nurse symbol with integrated finder and reassurance light on the top end of the unit,</li> <li>- Membrane keypad in antimicrobial finish with integrated LEDS for operation, consisting of: <ul style="list-style-type: none"> <li>- 1 call key,</li> <li>- 2 lighting keys</li> </ul> </li> <li>- 2.80 metre connection cable with auto-disconnecting RJ45 connector plug.</li> </ul> <p>It shall be supplied with cradle for holding patient terminals.</p>   | 16  | Nos. |          | 2,414    |                  | 38,624           |
| 7     | MR      | <p><b>Supply, Installation, Testing &amp; Commissioning of connection module for Patient Terminal</b></p> <p>Connection module for patient handset shall consist of:</p> <ul style="list-style-type: none"> <li>- 1 x RJ45 socket marked in colour and with measures to ensure that the push button is correctly connected, including auto disconnect mechanism,</li> <li>- 1 membrane keypad with: <ul style="list-style-type: none"> <li>- 1 call button (red with nurse symbol) including a finder/reassurance light,</li> <li>- 1 presence key/ cancel button (green) including a control LED,</li> </ul> </li> </ul>   | 16  | Nos. |          | 5,212    |                  | 83,392           |

| S. No | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
| 8     | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Room Terminal with display- For Voice Rooms</b>   |     |      |          |          |                  |                  |
|       |         | Supply of Room Terminal with display & integrated functional components and operating membrane keypad with symbols; consisting of:<br>- Electronic buzzer for acoustic call forwarding<br>- Membrane keypad for operation, comprising of:<br>- Call button (red) with integrated finder and reassurance light<br>- Doctor call button (blue) with integrated finder and reassurance light,<br>- Presence button (green) with control LED,<br>- Presence button (blue) with control LED, | 139 | Nos. |          | 12,486   |                  | 1,735,554        |
| 9     | MR      | <b>Supply, Installation, Testing &amp; Commissioning of module providing DVI output</b>   |     |      |          |          |                  |                  |
|       |         | Module to provide DVI output to connect with any 3rd party LCD/LED monitor to display nurse call notification on external LED/LCD screen. (Note: LCD/ LED screen to be provided by client)  | 28  | Nos. |          | 7,812    |                  | 218,736          |
| 10    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Call - Cancel Button - For common WC</b>  |     |      |          |          |                  |                  |
|       |         | A membrane keypad with:<br>- 1 call button (red) including a finder light & reassurance light,<br>- 1 presence button (green) incl. control LED,<br>- Moisture Protected<br>- 2 RJ45 port for connecting to the data bus  | 343 | No.  |          | 4,656    |                  | 1,597,008        |
| 11    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Code Blue button - Doctor call-Cancel button for wards</b>  |     |      |          |          |                  |                  |
|       |         | 1 doctor call key (blue) including a finder light / reassurance light,<br>- Doctor cancel button<br>- a membrane keypad<br>- Integrated sounder<br>-2 RJ45 ports for loop connectivity  | 199 | Nos. |          | 1,492    |                  | 296,908          |
| 12    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Loop Powered Lamp Module</b>  |     |      |          |          |                  |                  |



| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | For optical indication of calls, presences and reminders in the relevant colours conforming to VDE0834 consisting of:<br>- 5 light chambers with light reflectors for homogeneous illumination,<br>- 1 light chamber fitted with 3 ultra bright red LEDs,<br>- 1 light chamber fitted with 3 ultra bright white LEDs,<br>- 1 light chamber fitted with 3 ultra bright green LEDs,<br>- 1 light chamber fitted with 3 ultra bright blue LEDs,<br>- 1 light chamber fitted with 3 ultra bright Yellow LEDs,<br>- 2 RJ45 ports for loop connectivity<br>- the LED life expectancy is approximately 100,000 operating hours. | 290 | Nos. |          | 4,656    |                  | 1,350,240        |
|       |         | <b>Networking &amp; Integration with IPBX</b>  |     |      |          |          |                  |                  |
| 13    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Management center - Nurse Call Server</b>  |     |      |          |          |                  |                  |
|       |         | Management Centre Server for Nurse Call System for uploading the firmware and the system configuration, for operating interfaces to foreign systems, for logging of all system events and as a central location for system configuration and remote maintenance <b>as per VDE 0834</b> - Intel Xeon 3220 2,4GHz or similar<br>- 2 GB RAM, 1 x 160GB HDD<br>- 1 x DVD harddrive, 2 x Gbit LAN Ethernet RJ45<br>- 1 x serial connection RS232 and 2 x USBV2.0<br>- 1 x PCI or 1 x PICE socket, support for SUSE Linux enterprise Server from V10.1   | 3   | No.  |          | 146,587  |                  | 439,761          |
| 14    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Backbone Switch</b>  |     |      |          |          |                  |                  |
|       |         | Floor Switch:<br>Uplink connections: 2 x 1Gb uplink ports, RJ45 (GBIC capable, possibility for LWL) Connections downlink: 24 x 100Mb downlink ports, RJ45 Switch must have all the Layer 2 and Layer 3 function which is mentioned in the tender Document  | 8   | No.  |          | 16,091   |                  | 128,728          |
| 15    | MR      | <b>Supply, Installation, Testing &amp; Commissioning of Server Switch</b>  |     |      |          |          |                  |                  |
|       |         | Uplink connections: 4 x 10 Gb uplink ports, RJ45 or SFP (dual share ports) Optional: via GBIC usage FOC with 4 x 10 GB SFP (small form-factor pluggable) Downlink connections: 20 x 1 Gb downlink ports, RJ45  | 2   | No.  |          | 134,115  |                  | 268,230          |
| 16    | MR      | <b>Software- Integration with IPBX</b>   |     |      |          |          |                  |                  |
|       |         | This interface used Voice over IP technology in accordance with the standard H.323 or SIP (G.711 a-law, G.711 μ-law, G.729 a/b) and is used for telecommunications between the patient terminals and the public telephone network as well as to other in-house extensions.   | 2   | No.  |          | 354,863  |                  | 709,726          |

| S. No                                | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|--------------------------------------|---------|---|-------|------|----------|----------|------------------|-------------------|
| 1                                    | 1A      | 2   | 3     | 4    | 5        | 6        | 7                | 8                 |
| 17                                   | MR      | <b>Software- Event Database Software</b>  |       |      |          |          |                  |                   |
|                                      |         | Software pack installed on the system server for automatically logging all events in the entire communications system, such as, e.g., calls, presence markings, call acknowledgements, reminders.   | 3     | No.  |          | 291,822  |                  | 875,466           |
| 18                                   | MR      | <b>Cable, Conduit &amp; accessories</b>   |       |      |          |          |                  |                   |
|                                      |         | Supply, laying, testing & commissioning of 8 core CAT6 UTP cable with necessary connectors complete as required.  | 25725 | RM   |          | 22       |                  | 565,950           |
| 19                                   | 1.20    | Supplying & fixing of following size of steel conduit along with accessories in surface / recess including painting in case of surface conduit or cutting the wall and making good the same in case of recessed conduit as required   |       |      |          |          |                  |                   |
| 19.1                                 | 1.20.2  | 25mm dia  | 24250 | RM   | 147      |          | 3,564,750        |                   |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |         |   |       |      |          |          | <b>3,564,750</b> | <b>25,065,815</b> |
| L.                                   |         | <b>LIGHTNING PROTECTION SYSTEM AS PER IS/IEC-62305</b>  |       |      |          |          |                  |                   |
|                                      |         | <b>Design, supply, insttlayion, testing and commisioning of LIGHTNING PROTECTION SYSTEM AS PER IS/IEC-62305 comaplete as required fro following items.</b>  |       |      |          |          |                  |                   |
|                                      |         | <b>Air Terminal</b>   |       |      |          |          |                  |                   |
| 1                                    | MR      | Supply of 8 mm Aluminum Round Conductor complete as specified in drawing & Meets the requirements of DIN EN 50164-2 (VDE 0185 part 202) & VDE 0185-305 (IS/IEC 62305) ,   | 5961  | Mtr. |          | 85       |                  | 506,685           |
| 2                                    | MR      | Supply of Roof conductor holder for parapet- Polyamide Conductor holder:<br>With M8 female thread or diameter 7mm, M8 Screw to connect the conductor holder.<br>Weather and temperature resistant from -35 to +90 degree Celsius tested. Conductor holder @ 1 meter distance  | 2580  | Nos. |          | 65       |                  | 167,700           |
| 3                                    | MR      | Polyamide roof cable holder for flat roof:<br>DIN 48829 Form B1. Closed form with bottom. Filling weight 1Kg (frost-resistant concrete). Sleeve from polyethylene, black @ 1 meter distance.  | 3381  | Nos. |          | 170      |                  | 574,770           |
| 4                                    | MR      | Vertical air terminal with accessories:Providing of Air terminals as per IS-IEC -62305 part-3 16mm rod tapered to 10 mm aluminium rod :<br>Meets the technical specification according to DIN EN 50164-2 (VDE 0815 part 202).<br>Meets the requirement of VDE0185/305(IS/IEC 62305) 3Mtr<br>Airterminal: semi-hard (E-AMgSiO5 corresponds to DIN 48801)<br>Suitable for high wind load. | 34    | Nos. |          | 4,582    |                  | 155,788           |

| S. No | Code No | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3    | 4    | 5        | 6        | 7                | 8                |
| 5     | MR      | System consist of Fang Fix with base and clamp, on the top air terminal is erected. Fang fix clamp made of SS, lightning tested for 100 KA 10/350 micro sec waveform.  | 34   | Nos. |          | 384      |                  | 13,056           |
| 6     | MR      | 16 KG stone of 365 mm diameter, high level of stability. Quick and easy mounting of interception rod using anchors. Concrete, frost-resistant, can be stacked.   | 34   | Nos. |          | 542      |                  | 18,428           |
| 7     | MR      | Providing of cross universal connector: For T and cross connection, to route vertical down conductor /mesh formation made of hot dipped galvanised iron with necessary screws etc as required. Installed with 4 hexagonal bolts M8*25 with M8 hexagonal nuts .               | 555  | Nos. |          | 177      |                  | 98,235           |
| 8     | MR      | Providing of expansion piece with connector: For equalising temperature related length changes. Necessary on conductors length over 20 meters. For round conductor Rd 8/ALU.   | 253  | Nos. |          | 234      |                  | 59,202           |
| 9     | MR      | Connector: For T cross and parallel connectors. Quick installation using hexagonal bolt M10X30 high-grade hot dip galvanised. Conforms to the requirements according to DIN VDE 0185-305 (IS-IEC 62305)(2nos/expansion piece ).  | 506  | Nos. |          | 177      |                  | 89,562           |
|       |         | <b>Down Conductor</b>  |      |      |          |          |                  |                  |
| 10    | MR      | Supply of 8 mm Aluminum Round Conductor complete as specified in drawing & Meets the requirements of DIN EN 50164-2 (VDE 0185 part 202) & VDE 0185-305 (IS/IEC 62305) ,  | 4940 | Mtr. |          | 96       |                  | 474,240          |
| 11    | MR      | Supply of Roof conductor holder for parapet- Polyamide Conductor holder:<br>With M8 female thread or diameter 7mm, M8 Screw to connect the conductor holder.<br>Weather and temperature resistant from -35 to +90 degree Celsius tested. Conductor holder @ 1 meter distance | 4940 | Nos. |          | 56       |                  | 276,640          |
| 12    | MR      | Supply of Test Joint (Folding Clamp) suitable to connect 8mm round conductor and max by 30x3 mm GI strip as specified in drawing and directed by Engineer.   | 176  | Nos. |          | 328      |                  | 57,728           |
| 13    | MR      | Lightnig counter - To count no of lightning strike & it can record the date and time of the lightning incident also tested as per IEC 62561-6.   | 9    | Nos. |          | 16,045   |                  | 144,405          |
|       |         | <b>Earthing</b>  |      |      |          |          |                  |                  |

| S. No                                | Code No                  | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------------------------------|--------------------------|--|------|------|----------|----------|------------------|------------------|
| 1                                    | 1A                       | 2  | 3    | 4    | 5        | 6        | 7                | 8                |
| 14                                   | MR                       | Galvanised Steel Flat 30X3 mm thickness from earth electrode directly in ground as required. Flat conductor shall be of Hot Dipped & Cross sectional area of 90mm square According to DIN EN 50164-2 (VDE 0185 part 202) Meets the requirement of VDE0185/305(IS-IEC 62305) Zinc coating: 500 g/m square (Approx:70 micron coating) Should be tested and used exclusively for lightning protection earthing system and ring equipotential bonding. | 3155 | Mtr. |          | 113      |                  | 356,515          |
| 15                                   | MR                       | Cross connector for Flat: Suitable for 30mm Galvanised steel strip. Installed with 4 nos of hexagonal plate.   | 294  | Nos. |          | 258      |                  | 75,852           |
| 16                                   | MR                       | Flat conductor holder suitable for FL 30. Installed with 2 hexagonal bolts.  | 176  | Nos. |          | 153      |                  | 26,928           |
| 17                                   | MR                       | Plastic Corrosion Protection strip: Approx 1.1 mm thick. Width 50mm. Made of petrolatum- coated chemical fibre fabric.   | 10   | Nos. |          | 522      |                  | 5,220            |
| 18                                   | MR                       | UL Listed & CPRI tested maintenance free ,Low carbon copper coated earth rod of 3 metre electrode having diameter of 14.2 mm with copper coating thickness of 250micron tested as per IEC 62561-2  | 67   | Nos. |          | 1,660    |                  | 111,220          |
| 19                                   | MR                       | universal clamp made of SS to connect rod with flat conductor  | 67   | Nos. |          | 560      |                  | 37,520           |
| 20                                   | MR                       | Earth conductivity enhancing compound shall be of 25 kg/pit tested as per IEC 62561-7,TCLP tested .  | 67   | Nos. |          | 2,306    |                  | 154,502          |
| 21                                   | MR                       | The above arrangements shall be provided with Heavy duty earth champer of 5000kg load bearing capacity to ensure the safety of earthing system   | 67   | Nos. |          | 1,779    |                  | 119,193          |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |                          |  |      |      |          |          | <b>-</b>         | <b>3,523,389</b> |
| <b>M.</b>                            | <b>SAFETY EQUIPMENTS</b> |  |      |      |          |          |                  |                  |
| 1.0                                  | 2.21                     | Providing and fixing M.V. danger notice plate of 200 mm X 150 mm, made of mild steel, at least 2 mm thick, and vitreous enameled white on both sides, and with inscription in single red colour on front side as required.   | 58   | Each | 149      |          | 8,642            |                  |
| 2.0                                  | 2.22                     | Providing and fixing H.T. danger notice plate of 250 mm X 200 mm, made of mild steel, at least 2 mm thick, and vitreous enameled white on both sides, and with inscription in single red colour on front side as required.   | 8    | Each | 163      |          | 1,304            |                  |

| S. No                                | Code No            | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------------------------------|--------------------|--|-----|------|----------|----------|------------------|------------------|
| 1                                    | 1A                 | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 3.0                                  | MR                 | Supply and fixing wooden framed covered with glass shock treatment chart printed on cloth in English ,Hindi & Local language.  | 34  | Job  |          | 321      |                  | 10,914           |
| 4.0                                  | MR                 | Supply and fixing suitable size wooden framed covered with glass for Main Panel SLD in electrical room as per IE rules fixed to wall as required.  | 14  | Job  |          | 2,608    |                  | 36,512           |
| 5.0                                  | MR                 | Supply, installation, testing and commissioning of Standard First aid box complete with all accessories as required.   | 14  | Each |          | 1,471    |                  | 20,594           |
| 6.0                                  | MR                 | Portable 5 kg. dry type fire extinguisher suitable for electrical fire and as recommended by the tariff advisory committee.  | 38  | Each |          | 3,933    |                  | 149,454          |
| 7.0                                  | MR                 | Supply and fixing of in-position the fire extinguishers dry chemical power (ABC) 5 kg capacity.  | 38  | No.  |          | 2,461    |                  | 93,518           |
| 8.0                                  | MR                 | Supply and fixing of in position the fire extinguishers dry chemical power (ABC) 2 kg capacity.  | 38  | No.  |          | 1,525    |                  | 57,950           |
| 9.0                                  | MR                 | Supply and fixing of tool kit with all standard tools such as screw driver , spaner etc as required.   | 14  | Each |          | 5,352    |                  | 74,928           |
| 10.00                                | MR                 | Supply of 11kV pair of hand gloves.  | 7   | Set  |          | 1,204    |                  | 8,428            |
|                                      |                    | Supply, providing & fixing the following other miscellaneous items with all Accessories including labour charges etc complete: (ISI Makes only) Rubber mats of 11 KV grade 1.8 Mtrs x 0.9mts. and of 6mm thick.  | 800 | Sqm  |          | 4,366    |                  | 3,492,800        |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |                    |  |     |      |          |          | <b>9,946</b>     | <b>3,945,098</b> |
| <b>N.</b>                            | <b>MISC. WORKS</b> |  |     |      |          |          |                  |                  |
| 1                                    | 14.16              | Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, coupler etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc..direct in ground (75 cm below ground level)including excavation and refilling the trench but excluding sand cushioning and protective covering etc., complete as required. |     |      |          |          |                  |                  |
| 1.1                                  | 14.16.2            | 90 mm dia (OD-90 mm & ID-76 mm nominal)  | 500 | mtr. | 163      |          | 81,500           |                  |
| 2                                    | 14.14              | Providing, laying and fixing following dia RCC pipe NP2 class (light duty) in ground complete with RCC collars, jointing with cement mortar 1:2 (1 cement : 2 fine sand) including trenching (75 cm deep) and refilling etc. as required.  |     |      |          |          |                  |                  |

| S. No                                | Code No | Item Description  | Qty  | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------------------------------|---------|---|------|-------|----------|----------|------------------|------------------|
| 1                                    | 1A      | 2   | 3    | 4     | 5        | 6        | 7                | 8                |
| 2.1                                  | 14.14.2 | 150 mm dia  | 50   | meter | 405      |          | 20,250           |                  |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |         |   |      |       |          |          | <b>101,750</b>   | <b>-</b>         |
| O.                                   |         | <b>FIRE DETECTION AND ALARM SYSTEM - ANALOG ADDRESSABLE SYSTEM</b>  |      |       |          |          |                  |                  |
|                                      |         | Design, Supply, installation, testing & commissioning of Fire Detection & Alarm system as per local fire norms & NBC / NFPA Codes:  |      |       |          |          |                  |                  |
| 1                                    | MR      | <b>SMOKE DETECTOR (PHOTO ELECTRIC)</b>  |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing and commissioning of UL listed addressable intelligent <b>Smoke detector (Photo Electric)</b> with mounting base, dual LED, complete with base as required. Detectors should be suitable for the <b>multi co-operative sensing</b> .  | 6120 | Nos.  |          | 2,523    |                  | 15,440,760       |
| 2                                    | MR      | <b>MULTITECH (PHOTO-THERMAL) DETECTOR</b>   |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing and commissioning of UL listed addressable intelligent <b>Multitech (Photo-Thermal) detector</b> with auto floating sensitivity ( <b>Acclimate type</b> ) with mounting base, dual LED, complete with base as required.   | 438  | Nos.  |          | 2,523    |                  | 1,105,074        |
| 3                                    | MR      | <b>HEAT DETECTOR</b>  |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing and commissioning of UL listed addressable intelligent rate of rise <b>thermistor type</b> resettable <b>Heat detector</b> with mounting base, dual LED, complete with base as required.  | 27   | Nos.  |          | 2,389    |                  | 64,503           |
| 4                                    | MR      | <b>BEAM DETECTOR</b>  |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing & commissioning of <b>Addressable beam detector</b> (with Expandar) with 4 manual and 2 acclimate sensitivity setting. Address switch to program the detectors with transmitter and receiver as one unit. It shall cover upto <b>300 feet</b> of coverage distance. (UL Listed) | 8    | Nos.  |          | 83,288   |                  | 666,304          |
| 5                                    | MR      | <b>MANUAL CALL POINT</b>  |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing & commissioning of addressable <b>Manual call point (Pull station-double action)</b> .  | 121  | Nos.  |          | 5,966    |                  | 721,886          |
| 6                                    | MR      | <b>FAULT ISOLATOR</b>   |      |       |          |          |                  |                  |
|                                      |         | Supply, installing, testing and commissioning of addressable type <b>Fault Isolators</b> for isolating shorted, de wired and loose circuits between two successive fault isolators with automatic resetting arrangement.  | 382  | Nos.  |          | 2,036    |                  | 777,752          |
| 7                                    | MR      | <b>RELAY CONTROL MODULES</b>  |      |       |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3    | 4    | 5        | 6        | 7                | 8                |
|       |         | Supply, installing, testing and commissioning of <b>addressable and automatic commandable Relay control modules.</b>   | 82   | Nos. |          | 3,757    |                  | 308,074          |
| 8     | MR      | <b>CONTROL MODULES</b>   |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of <b>addressable and automatic commandable control modules.</b>   | 287  | Nos. |          | 3,757    |                  | 1,078,259        |
| 9     | MR      | <b>MONITOR MODULES</b>   |      |      |          |          |                  |                  |
|       |         | Supply, Installation, testing and commissioning of <b>Addressable Monitor modules.</b>   | 110  | Nos. |          | 2,969    |                  | 326,590          |
| 10    | MR      | <b>RESPONSE INDICATOR</b>  |      |      |          |          |                  |                  |
|       |         | Supply, installation, fixing, testing and commissioning of <b>Response Indicator cum lamp assembly</b> mounted on walls /partitions, surface /recessed etc. in dust tight enclosure, including chase cutting complete as required.   | 2745 | Nos. |          | 239      |                  | 656,055          |
| 11    | MR      | <b>STROBES CUM DUAL TONE HOOTERS</b>   |      |      |          |          |                  |                  |
|       |         | Supply, installation, testing and commissioning of <b>Strobes cum Dual tone hooters with minimum of 110cd and 93 db</b> complete as required.  | 121  | Nos. |          | 7,619    |                  | 921,899          |
| 12    | MR      | <b>Power Supply for Hooter &amp; Strobes</b>   |      |      |          |          |                  |                  |
|       |         | <b>Supply, installation, testing and commissioning of Power Supply for Hooter &amp; Strobes</b> Addressable 6A, 24V DC power supply for hooters and strobes.   | 28   | Nos. |          | 5,129    |                  | 143,612          |
| 13    | MR      | <b>FIRE ALARM CONTROL PANEL</b>  |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of Microprocessor based intelligent and electronically <b>addressable</b> , modular, <b>expandable, networkable, loops as given below (each loop consist of 159 detector &amp; 159 devices) Fire Alarm Control Panel</b> with minimum 6 inch/ 640 character LCD display, multiple access levels, event history file in non-volatile memory (EEPROM). The panel shall support programmable relays controlled by powerful Boolean logic equation. The panel shall have 240 volts AC power supply, automatic battery charger, 24 volts, sealed lead acid maintenance free batteries sufficient for 24 hours normal working and then be capable of operating the system for 60 minutes during emergency condition. The panel shall be UL listed 9th Edition (With Networking Card Compatible to Fiber Optic Cable) |      |      |          |          |                  |                  |
|       |         | <b>10 Loop (each loop consist of 159 detector &amp; 159 devices)</b>   | 6    | Nos. |          | 677,997  |                  | 4,067,982        |
| 14    | MR      | <b>FIRE ALARM CONTROL PANEL</b>  |      |      |          |          |                  |                  |

| S. No  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|        |         | Supply, installing, testing and commissioning of Microprocessor based intelligent and electronically <b>addressable</b> , modular, <b>expandable, networkable, loops as given below (each loop consist of 159 detector &amp; 159 devices) Fire Alarm Control Panel</b> with minimum 6 inch / 640 character LCD display, multiple access levels, event history file in non-volatile memory (EEPROM). The panel shall support programmable relays controlled by powerful Boolean logic equation. The panel shall have 240 volts AC power supply, automatic battery charger, 24 volts, sealed lead acid maintenance free batteries sufficient for 24 hours normal working and then be capable of operating the system for 60 minutes during emergency condition. The panel shall be UL listed 9th Edition (With Networking Card Compatible to Fiber Optic Cable) |     |      |          |          |                  |                  |
| 14.1   |         | <b>2 Loop (each loop consist of 159 detector &amp; 159 devices)</b>   | 3   | Nos. |          | 255,342  |                  | 766,026          |
| 14.2   |         | <b>4 Loop (each loop consist of 159 detector &amp; 159 devices)</b>   | 4   | Nos. |          | 343,178  |                  | 1,372,712        |
| 14.3   |         | <b>5 Loop (each loop consist of 159 detector &amp; 159 devices)</b>   | 1   | Nos. |          | 399,879  |                  | 399,879          |
|        |         |   |     |      |          |          |                  |                  |
| 16     | MR      | <b>NETWORKABLE ACTIVE REPEATER PANEL</b>  |     |      |          |          |                  |                  |
|        |         | Supply, installing, testing and commissioning of <b>Networkable Active Repeater panel</b> with minimum 6 inch/ 640 character LCD Display complete with accessories as required.   | 2   | No.  |          | 208,216  |                  | 416,432          |
|        |         |   |     |      |          |          |                  |                  |
| 17     | MR      | <b>INTIGRATED DIGITAL VOICE EVACUATION AND DIGITAL 2 WAY COMMUNICATION FIRE FIGHTER SYSTEM</b>  |     |      |          |          |                  |                  |
|        |         | Supply, installing, testing and commissioning of Integrated <b>8 channel (FOR 8 DIFFERENT TYPE OF MESSAGES TO GET RELAYED SIMULTANEOUSLY) Digital Voice Evacuation and 2 way Communication Fire Fighters System</b> capable to supervise all the speaker circuits, with required number of <b>zone control as given below</b> and accessories required to complete the system. The equipment shall be of same make as panel. DVC shall offer minimum one fire man's telephone circuit & one speaker's circuit. <b>DVC shall be with in-built digital microphone, fire man's telephone hand set &amp; PA Zone control</b>  |     |      |          |          |                  |                  |
|        |         | DVC with 24 zone control  | 9   | Nos. |          | 184,958  |                  | 1,664,622        |
| Notes: |         | Networkable DVC with in-built features like:  |     |      |          |          |                  |                  |
| a.     |         | In-built 'PA' Zone control  |     |      |          |          |                  |                  |
| b.     |         | In-built 'PA' Microphone  |     |      |          |          |                  |                  |
| c.     |         | In-built Fire Main's telephone hand set for 2 way communications.   |     |      |          |          |                  |                  |



| S. No | Code No | Item Description  | Qty  | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3    | 4    | 5        | 6        | 7                | 8                |
| d.    |         | 'Aux'/ IPAD/ EPABX Input ports for music  |      |      |          |          |                  |                  |
| e.    |         | Facility to control all PA zones  |      |      |          |          |                  |                  |
| f.    |         | Facility to relay pre-corded massages   |      |      |          |          |                  |                  |
| g.    |         | DVC to give out one Fire Man's telephone riser & 32 Nos. Digital Amplifiers loop.   |      |      |          |          |                  |                  |
| 18    | MR      | <b>DIGITAL AMPLIFIERS</b>   |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of Addressable & fully supervised <b>DIGITAL AMPLIFIERS</b> with <b>minimum Wattage as given below with 70.7 VRMS</b> . The Digital Amplifiers shall have inbuilt minimum of 4 Speakers Zone Circuits and <b>minimum 1 Fire Fighters communication</b> . The Amplifiers shall be <b>stand alone</b> with its own battery backup incase of Main fire Alarm panel/ Digital Voice Panel failure and the Digital Amplifiers shall still be in position to carry out Voice Evacuation. |      |      |          |          |                  |                  |
| 18.1  | MR      | 200 Watts   | 5    | Nos. |          | 395,664  |                  | 1,978,320        |
| 18.2  | MR      | 500 Watts   | 13   | Nos. |          | 668,361  |                  | 8,688,693        |
|       |         | a. Amplifier shall sit on Amplifier loop  |      |      |          |          |                  |                  |
|       |         | b. Amplifier shall have minimum in-built four PA speaker zones  |      |      |          |          |                  |                  |
|       |         | c. Amplifier shall have a fire man's telephone riser  |      |      |          |          |                  |                  |
|       |         | d. Amplifier shall support 2 way communication for fire man   |      |      |          |          |                  |                  |
|       |         | <b>e. Telephone hand set for 2 way communication to be ordered seperately as may be required.</b>   |      |      |          |          |                  |                  |
| 19    | MR      | <b>CEILING MOUNTED SPEAKERS</b>   |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of Fire panel supervised 78db-90db <b>Ceiling Mounted Speakers</b> as specified & same make as of panel. Speakers shall be 2 Watt with multi taps of 0.25W, 0.5W, 1W and 2W.  | 5435 | Nos. |          | 2,537    |                  | 13,788,595       |
| 20    | MR      | <b>WALL MOUNTED SPEAKERS</b>  |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of Fire panel supervised 78db-90db <b>Wall Mounted Speakers</b> as specified & same make as of panel. Speakers shall be 2 Watt with multi taps of 0.25W, 0.5W, 1W and 2W.   | 13   | Nos. |          | 2,811    |                  | 36,543           |
| 21    | MR      | <b>FIRE FIGHTERS TELEPHONE JACK</b>   |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of 2 way communication <b>Fire Fighter's Telephone Jack</b>   | 121  | Nos. |          | 2,594    |                  | 313,874          |
| 22.0  | MR      | <b>FIRE FIGHTERS HANDSET</b>  |      |      |          |          |                  |                  |
|       |         | Supply, installing, testing and commissioning of 2 way communication <b>Fire Fighter's Handset</b>  | 27   | Nos. |          | 20,853   |                  | 563,031          |
| 23.0  | MR      | <b>WIRES IN CONDUITS:</b>   |      |      |          |          |                  |                  |

| S. No        | Code No | Item Description   | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------|---------|--|-------|-------|----------|----------|------------------|------------------|
| 1            | 1A      | 2  | 3     | 4     | 5        | 6        | 7                | 8                |
| 23.1         | MR      | Supply & laying in existing conduits, 2x1.5 sq.mm 450/ 750V grade FR-LSH PVC insulated, un-sheathed copper conductor wire including terminations, connections & all labour and material etc.complete as required (For fire detection signal, for fire loop, for speakers, for tele jacks).   | 57726 | Meter |          | 89       |                  | 5,137,614        |
| 23.2         | MR      | Supply & laying in existing conduits, 2x1.5 sq.mm 450/ 750V grade FR-LSH PVC insulated, un-sheathed copper conductor wire including terminations, connections & all labour and material etc.complete as required. (For Hooters/ Strobes power).  | 7825  | Meter |          | 89       |                  | 696,425          |
| 24           | 1.20    | Supplying and fixing of following sizes of steel conduit along with accessories in surface/ recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.  |       |       |          |          |                  |                  |
| 24.1         | 1.20.2  | 25 mm  | 65551 | Meter | 147      |          | 9,635,997        |                  |
|              |         | <b>FIRE SURVIVAL ARMoured CABLE</b>  |       |       |          |          |                  |                  |
| 25           | MR      | Supply & laying of LPCB certified 2c x 1.5 sq.mm Fire Survival/ Resistance Armoured cable (600/1000V) with class-2 Copper conductor having halogen free ceramified silicon rubber insulation as per BS EN 50363 and low smoke zero halogen (LSZH) inner & outer sheath. Should comply to EN 61034-2 & EN 60754-1. LPCB-FPC certificate to be submitted. The cables should meet fire performance circuit integrity test as per BS EN 50200: PH-120. Outer sheath should be in red colour with Anti-rodent & LSZH properties, 950°C rating for three hours for fire alarm system. (with Fixing arrangement)            | 100   | RM    |          | 206      |                  | 20,600           |
|              |         | <b>TERMINATION OF FIRE SURVIVAL ARMoured CABLE</b>   |       |       |          |          |                  |                  |
| 26           |         | Supply, Installation, testing & commissioning of Halogen free glands & termination for Fire Survival/ Resistance Armoured cable (600/1000V) with class-2 Copper conductor having halogen free ceramified silicon rubber insulation as per BS EN 50363 and low smoke zero halogen (LSZH) inner & outer sheath. Should comply to EN 61034-2 & EN 60754-1. LPCB-FPC certificate to be submitted. The cables should meet fire performance circuit integrity test as per BS EN 50200:PH-120. Outer sheath should be in red colour with Anti-rodent & LSZH properties, 950°C rating for three hours for fire alarm system. | 10    | Nos.  |          | 130      |                  | 1,300            |
| <b>Notes</b> |         |  |       |       |          |          |                  |                  |
| i.           |         | <b>All hooters/ strobes shall also be power wired directly from the fire control panel will 2x1.5 sq.mm in separate conduits in a loop.</b>  |       |       |          |          |                  |                  |

| S. No                                | Code No                             | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|--------------------------------------|-------------------------------------|--|-----|------|----------|----------|------------------|-------------------|
| 1                                    | 1A                                  | 2  | 3   | 4    | 5        | 6        | 7                | 8                 |
| ii.                                  |                                     | Necessary interlocking, relays, power supplies and wiring etc. that may be required to automatically start smoke exhaust fans and staricase/ lift well pressurization fans and to stop automatically air-conditioning plant and indoor air supply units and fire dampers on the detection of a fire signal through the fire alarm panel to be included in the scope of work and costs quoted above. It should also ensure automatic opening of all access controlled doors on fire signal.   |     |      |          |          |                  |                   |
| iii.                                 |                                     | It will be an absolute responsibility of the contractor to ensure design of fire safety system/ sequence as per NFPA/ NBC/ Indian standards.   |     |      |          |          |                  |                   |
| iv.                                  |                                     | Contractor shall submit the fire life safety sequence of operation of various exhaust and pressurization fans and AC plants for approval to client/ architect/ consultant before implementation.   |     |      |          |          |                  |                   |
| v.                                   |                                     | Contractor to submit fire detection schematic.   |     |      |          |          |                  |                   |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |                                     |  |     |      |          |          | <b>9,635,997</b> | <b>62,123,416</b> |
| <b>P.</b>                            | <b>IP CCTV SURVEILLANCE SYSTEMS</b> |  |     |      |          |          |                  |                   |
| 1                                    | MR                                  | Supply , installation , testing and commissioning of Outdoor IR 1080p60fps HD PTZ Camera with 1/2.8" progressive scan Exmor CMOS, Effective pixels 1920 x 1080 approx. 2.1M pixels, 30x Optical Zoom 4.5 mm - 135 mm (F1.6 - F4.4); Optical Zoom Field of View (FOV) :- 2.4° - 60.9°, 16X Digital Zoom, Minimum Illumination- Sense up on- Color: 0.05 lux , B/W: 0.01 lux, With infrared (IR) 0 lux, WDR 90dB, Video Analysis ( Object removal , Loitering , Enter or Exit from the Field , Object Classification etc.) Intelligent Dynamic Noise Reduction, BLC, White Balance, Mechanical switchable IR filter, Pan Range 360° continuous, Tilt Range 0°-90°, Pan/Tilt Modes - Pan: 0.1°/s - 240°/s; Tilt: 0.1°/s - 120°/s, Presets 256 , Tours, IR distance 150 m (590 feet) (Detection), IR can be internal or external with full 360 deg PAN coverage Audio- 1/1 Channel In/Out, Memory card slot (support upto 1TB) , 24 individually configurable privacy masks, Simple singlecable installation with POE+ support for indoor/Outdoor application,art. site condition. | 1   | Nos. |          | 243,383  | 243,383          |                   |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 2     | MR      | Supply , installation , testing and commissioning of 5MP 30 fps HD Outdoor IR IP bullet camera with 1/2.9-inch CMOS, Sensor pixels 2612 (H) x 1980(V), Sensitivity-0.24 lx (color) 0.05 lx (mono) ,IR range 60 mtrs, Dynamic range 100 db, True day/night, Automatic Electronic Shutter, Video compression H.265 MP ; M-JPEG, White balance, BLC, H.265 quad-streaming, Video Analysis ( Object removal , Loitering , Enter or Exit from the Field , Object Classification etc.), PrivacyMask, Analog video output, Auto Varifocal Lens (zoom / focus) 2.7mm to 12 mm lens, Two-way, full duplex Audio, Audio compression AAC, G.711, L16 (live and recording), 60 s pre-alarm recording Memory card slot support upto 256 GB , IP66 , ONVIF Profile S, CE, UL, FCC Certified. | 2   | Nos. |          | 67,374    |                  | 134,748          |
| 3     | MR      | Supply , installation , testing and commissioning of 5MP 30 fps HD Indoor IR IP bullet camera with 1/2.9-inch CMOS, Sensor pixels 2612 (H) x 1980(V), Sensitivity-0.24 lx (color) 0.05 lx (mono) ,IR range 60 mtrs, Dynamic range 100 db, True day/night, Automatic Electronic Shutter, Video compression H.265 MP ; M-JPEG, White balance, BLC, H.265 quad-streaming, Video Analysis ( Object removal , Loitering , Enter or Exit from the Field , Object Classification etc.), PrivacyMask, Analog video output, Auto Varifocal Lens (zoom / focus) 2.7mm to 12 mm lens, Two-way, full duplex Audio, Audio compression AAC, G.711, L16 (live and recording), 60 s pre-alarm recording Memory card slot support upto 256 GB , IP66 , ONVIF Profile S, CE, UL, FCC Certified.  | 13  | Nos. |          | 67,374    |                  | 875,862          |
| 4     | MR      | Supply , installation , testing and commissioning of 1080p HD Indoor IP Dome camera with 1/2.7-inch CMOS, Sensor pixels 1920 x 1080, Sensitivity-0.24 lx (color) 0.05 lx (mono) , Dynamic range, True day/ night, Automatic Electronic Shutter, Video compression H.264 MP (Main Profile); M-JPEG, White balance, BLC, H.264 quad-streaming, Motion/tamper/audio detection, Privacy Mask, Motion detection, Tamper alarm, Auto Varifocal Lens 3 to 10 mm lens, Built-in icrophone, Two-way, full duplex Audio, Audio compression AAC, G.711, L16 (live and recording), Memory card slot (support upto 1TB), 3-axis adjustment (pan/tilt/ rotation), ONVIF Profile S, CE, UL, FCC Certified.  | 357 | Nos. |          | 36,334    |                  | 12,971,238       |
| 5     | MR      | Supply , installation , testing and commissioning of server for video management, recording and failover management with N+N configuration suitable for proposed system complete with required hardware, as per detail enclosed specification & list of approved make.   | 2   | Lot  |          | 1,070,506 |                  | 2,141,012        |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 6     | MR      | Supplying, Installation, Testing & Commissioning of Enterprise-class Client/ Server based video management System Software for license of min 300 camera and 8 client workstation with alarm priorities and selectable user group distribution, Support Mobile video client for live and playback, Support 3rd Party ONVIF S profile, RTSP, http, camera with PTZ functionality if required in future, Dual Authorization, Supports Forensic Search, Different Time Zone Support, Support Remote ccess, Automatically Map the cameras goes into which storage, Support 4 Monitors per Client. complete in all respects as per specifications.VMS shall support continuous operation during management server oowntimes as live viewing, playback of recording and export of video data. Lot times It shall have feature of System Monitoring<br>1) System-wide health monitoring, including cameras, computers, and software.<br>2) Network equipment and other third-party devices monitored with SNMP. | 2   | Lot  |          | 1,059,000 |                  | 2,118,000        |
| 7     | MR      | Supply, installation, testing and commissioning of network storage solution with redundant hot-swappable power supplies and cooling fans. Dual Intel i210AT Gigabit LAN Ethernet ports for highest speed iSCSI connectivity. It shall offer Remote monitoring via desktop application, browser or SNMP. It shall provide a minimum of 128 concurrent iSCSI connections. It shall have 64 TB raw capacity, after RAID 6 configuration usable storage should be 44 TB as per list of approved makes. (minimum 256TB (64 TB x 4 Box) is required, bidder has tosubmit storage calculation from OEM & propose hard disk for minimum 30 days continuous recording of all the cameras at full resolution & full frame rate, from the calculation if hard disc capacity comes more than 256 TB then bidder has to supply the same without extra cost. Bidder has to provider minimum 4 storage boxes. Incase of failover of 1 or more boxes recording should be continues on balance boxes or even in one box)  | 2   | Lot  |          | 845,626   |                  | 1,691,252        |
| 8     | MR      | Supply, Installation & Commissioning of Workstation latest Intel® i7 7th Generation, processor, Intel Chipset motherboard, 8GB DDR3 RAM, 500 GB SATA HDD at 7200 rpm, Graphic card with 2 GB edicated RAM with display ports/ DVI/ HDMI port, DVD writer, Giga LAN Card, Keyboard, optical Mouse as per list of approved makes.  | 2   | Nos. |          | 118,162   |                  | 236,324          |
| 9     | MR      | Supply, Installation & Commissioning of 55" Monitor complete as required   | 5   | Nos. |          | 84,971    |                  | 424,855          |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 10    | MR      | Supply, Installation & Commissioning of 32" Monitor complete as required   | 5   | Nos. |          | 35,627   |                  | 178,135          |
| 11    | MR      | Supply, Installation, Testing & Commissioning of 12 ports full loaded LIU Box with all the required pigtailed complete in all respect as approved by Engineer in charge of works. Make: D-Link/ Amp/ Molex/ Schneider  | 20  | Nos. |          | 8,965    |                  | 179,300          |
| 12    | MR      | Supply, Installation, Testing & Commissioning of 1-port 1000BASE-LX Small Form Factor Pluggable (SFP) Gigabit Ethernet Transceiver, connector type: LC. Digital Diagnostic Monitoring Interface. Complete in all respect up to entire satisfaction Engineer in charge of works. Switch and SFP should be from same OEM only Make: CISCO/ Juniper/ Extreme  | 43  | Nos. |          | 20,654   |                  | 888,122          |
| 13    | MR      | Supply, Installation, Testing & Commissioning of OFC Patch Cord. Make: D-Link/ Amp/ Molex/ Schneider   | 27  | Nos. |          | 1,869    |                  | 50,463           |
| 14    | MR      | Supply, Installation, Testing and commissioning of Managable 24 port Switch with Power on Ethernet (PoE) enabled, 10/100, RJ45 Access ports with PoE complete as required (Make:CISCO)   | 21  | Nos. |          | 150,059  |                  | 3,151,239        |
| 15    | MR      | Supply, Installation, Testing and commissioning of Layer -2 Switch with Power on Ethernet (PoE) enabled, 24 x Gigabit RJ45 Access ports with PoE+, including 2 x Combo Gigabit ports, plus 2 x 10 Gigabit SFP+ Uplink ports and 2 x 10 Gigabit SFP+ dual-use Stack/ Uplink ports, All 24 access ports should be capable of providing 30W of Power Budget Non-Blocking Switching fabric of 128 GBPS and Forwarding rate of 95 MBPS, 16 K MAC Address and 256 VLAN Operating Temperature – 0 to 50° C, RIP v1/v2 Dynamic IP Routing, DHCPv6 Guard, Multicast Listener Discovery v1/v2 Snooping & Proxy, IPv6 features, including First-Hop Security, Neighbour Discovery Inspection, Source Guard, and Router Advertisement Guard with 600VA UPS, 15M Backup, Internal SMF Batteries Switch and SFP should be from same OEM only. Make: Cisco/ Avaya | 21  | Nos. |          | 212,942  |                  | 4,471,782        |

| S. No | Code No | Item Description  | Qty   | Unit   | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|--------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3     | 4      | 5        | 6        | 7                | 8                |
| 16    | MR      | Supply, Installation, Testing and commissioning Core Switch Layer 3 Port Density: 12 x 10/ 100/ 1000 Base-T PoE+ ports, 36 x 1G SFP ports and two 10G SFP+ uplink port, Switching Fabric - 172 Gbps Packer Forwarding - 100 Mbps, 32K MAC Addresses and 4K VLAN and Switch configured with 2GB of 800 DDR3 DRAM JUMBO FRAME: At least 9Kb support, support internal Field Replaceable and Hot Swappable PSU in N+N Redundancy architecture from day 1.Layer 3 Features - Static Routing, RIPng, OSPFv3, VRRP, PIM SM and BGP+ support from day 1 Should support up-to at least 4000 IP Multicast Streams simultaneously and at least 4000 IGMP interfaces Switch should have capability to support MAC-Sec in future, if required, Core Switch should ideally be EAL/ NDCPP certified, Operating Temperature-0 to 50°C<br>Switch and SFP should be from same OEM only<br>Make: Cisco/ Avaya | 2     | Nos.   |          | 298,945  |                  | 597,890          |
| 17    | MR      | Supply, Installation, Testing & Commissioning of 24 Port Patch Panel. Make: D-Link/Amp/Molex/ Schneider   | 10    | Nos.   |          | 3,945    |                  | 39,450           |
| 18    | MR      | Supply, Installation, Testing & Commissioning of 6U rack indoor/outdoor for switch Mounting with Fan and power Strip, PDU, Hardware Mounting Kit Make: Comrack/HCL/Rittal/Dynamic/Rackom  | 20    | Nos.   |          | 8,880    |                  | 177,600          |
| 19    | MR      | Supply, Installation, Testing & Commissioning of 42U rack for switch Mounting with Fan and power Strip, PDU, Hardware Mounting Kit<br>Make: Comrack/ HCL/ Rittal/Dynamic  | 2     | Nos.   |          | 55,707   |                  | 111,414          |
| 20    | MR      | Supply,Installation,Testing & Commissioning of 3 Core Power Cable 1.5 sqmm . Make :Finolex/ Polycab /Havells  | 12250 | Meters |          | 507      |                  | 6,210,750        |
| 21    | MR      | Supply, Installation, Testing & Commissioning of Single mode 6 OFC ARMOURED cable. Make: D-Link/Amp/Molex/Schneider   | 8750  | Meters |          | 498      |                  | 4,357,500        |
| 22    | MR      | Supply, Installation, Testing & Commissioning of CAT 6 STP Cable complete in all respect up to entire satisfaction Engineer in charge of works.<br>Make:Molex/Systimax/Panduit  | 30710 | Meters |          | 68       |                  | 2,088,280        |
| 23    | 1.2     | Supply and fixing of following sizes of PVC conduit along with the accessories in surface/ recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required   |       |        |          |          |                  |                  |
| 23.1  | 1.21.2  | 25 mm dia   | 27610 | Meters | 69       |          | 1,905,090        |                  |

| S. No                                | Code No          | Item Description   | Qty | Unit   | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items  |
|--------------------------------------|------------------|--|-----|--------|----------|----------|------------------|-------------------|
| 1                                    | 1A               | 2  | 3   | 4      | 5        | 6        | 7                | 8                 |
| 24                                   | MR               | Supply, Installation, Testing and Commissioning of 10 KVA UPS On Line With 1 hour Backup complete in all respect up to entire satisfaction Engineer in charge of works   | 1   | Nos.   |          | 134,806  |                  | 134,806           |
| 25                                   | MR               | Supply, Installation, Testing and Commissioning of 10/ 100/ 1000 Media Converter.<br>Make: D-Link/Amp/Molex/Schneider  | 18  | Nos.   |          | 4,919    |                  | 88,542            |
| 26                                   | MR               | Supply,Installation ,Testing and Commissioning of Junction Box.Make: Rittal/Hensal/Comrack/Dynamic   | 52  | Nos.   |          | 734      |                  | 38,168            |
| 27                                   | 14.14            | Providing, laying and fixing following dia RCC pipe NP2 class (light duty) in ground complete with RCC collars, jointing with cement mortar 1:2 (1 cement : 2 fine sand) including trenching (75 cm deep) and refilling etc as required (for road crossing )   |     |        |          |          |                  |                   |
| a.                                   | 14.14.4          | 300 mm dia   | 200 |        | 592      |          | 118,400          |                   |
| b.                                   | 14.14.2          | 150 mm dia   | 260 | Meters | 405      |          | 105,300          |                   |
| 28                                   | MR               | Supply, Installation, Testing and Commissioning of 6m high (5m above ground) 80mm dia upto 3 meter and 60mm dia for other 3meter GI pole as approved, adopting socket at top for fixture mentioned below, base plate 300 x 300 x 6 mm and provision for mounting junction box etc. - 1 set.ith suitable cement concrete foundation including excavaton, ncluding supply and fixing of foundation & all civil work suitable for outdoor camera including connection etc. complete as per pecifications & as required for mounting of PTZ CCTV Camera. | 1   | Nos.   |          | 31,453   |                  | 31,453            |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |                  |  |     |        |          |          | <b>2,128,790</b> | <b>43,631,568</b> |
| <b>Q.</b>                            | <b>ELEVATORS</b> |  |     |        |          |          |                  |                   |
|                                      |                  | Design, manufacture, supply, installation, testing, commissioning, approvals (statutory or otherwise) and handing over in satisfactory working conditions of Elevators with directional collective control for cars (as required) with AC VVVF control with automatic rescue device (ARD) and with automatic centre opening car door & landing doors, stone flooring with 25mm recess (for floor finish by Owners) including the cost of providing 4 weeks satisfactory trial operation  |     |        |          |          |                  |                   |



| S. No    | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|----------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1        | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|          |           | and testing at 110% of design load and safety checks including simulation tests of over load, over shoot, over speed, sudden breaks, emergency calls, fire man's switch operation etc. and each elevator to be programmed for jerkless operation and including providing free comprehensive maintenance service for 12 months after final virtual completion and satisfactory handing over as DLP, complete as per specifications as required and as below: |     |      |          |          |                  |                  |
|          |           | Lifts shall have BMS Compatable Central Elevator monitoring panel including all installation accessories and including Power and Control cabling complete as necessary required at site.  |     |      |          |          |                  |                  |
|          |           |   |     |      |          |          |                  |                  |
| <b>1</b> | <b>MR</b> | <b>Goods Elevators as described above for: (IPD B+G+6) MR</b>   |     |      |          |          |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/ architect   |     |      |          |          |                  |                  |
| 2        |           | Capacity (kgs): 2000 Kgs  |     |      |          |          |                  |                  |
| 3        |           | Contract Speed (m/s): 0.55  |     |      |          |          |                  |                  |
| 4        |           | Machine: Gearless   |     |      |          |          |                  |                  |
| 5        |           | Machine Location: Terrace   |     |      |          |          |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with Duplex/ Triplex Selective Collective. Microprocessor-Based system as per site condition  |     |      |          |          |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.  |     |      |          |          |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz  |     |      |          |          |                  |                  |
| 9a.      |           | Stops: 8 Front  |     |      |          |          |                  |                  |
| 9b.      |           | Emergency Landings: N/A   |     |      |          |          |                  |                  |
| 10       |           | Openings: 7 Front - Cnetral Opening   |     |      |          |          |                  |                  |
| 11       |           | Floors Served: Basement, Ground to Sixth floors   |     |      |          |          |                  |                  |
| 12       |           | Travel height: 33.6 Mtrs. (approx.)   |     |      |          |          |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2750 (W) x 3050 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>   |     |      |          |          |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2330 (W) x 2850 (D)   |     |      |          |          |                  |                  |
| 15       |           | Entrance Size (mm):<br>As per CPWD  |     |      |          |          |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)  |     |      |          |          |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed. Centre Opening Door. Minimum opening speed 2-1/2 FPS.   |     |      |          |          |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 19    |         | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |          |                  |                  |
| 20    |         | Buffers: Oil   |     |      |          |          |                  |                  |
| 21    |         | Compensation: Provider's standard application  |     |      |          |          |                  |                  |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device, All Floors.   |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 30.20    |           | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |           |                  |                  |
| 30.21    |           | System Diagnostic Means and Instructions.  |     |      |          |           |                  |                  |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                                      |     |      |          |           |                  |                  |
|          |           | Goods Elevators as described above for: (IPD B+G+6) MR   | 6   | Sets |          | 3,367,226 |                  | 20,203,356       |
| <b>2</b> | <b>MR</b> | <b>Goods Elevators as described above for: (IPD G+6) MR</b>  |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/ architect  |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 2000 Kgs   |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 0.55   |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with Duplex/ Triplex Selective Collective. Microprocessor-Based system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                               |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 7 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 7 Front - Central Opening  |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to Second floors   |     |      |          |           |                  |                  |
| 12       |           | Travel height: 29.4 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2750 (W) x 3050 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>                    |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2330 (W) x 2850 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>As per CPWD   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed. Centre Opening Door. Minimum opening speed 2-1/2 FPS.                |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                                      |     |      |          |           |                  |                  |
|          |           | Goods Elevators as described above for: (IPD G+6) MR   | 2   | Sets |          | 3,240,151 |                  | 6,480,302        |
| <b>3</b> | <b>MR</b> | <b>GOODS ELEVATORS (WITH MACHINE ROOM) AYUSH</b>   |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/ architect  |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 2000 Kgs   |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 0.55   |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with Duplex/ Triplex Selective Collective. Microprocessor-Based system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                               |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 2 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 2 Front - Central Opening  |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to 1st floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 9 Mtrs. (approx.)   |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2750 (W) x 3050 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>                    |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2330 (W) x 2850 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>As per CPWD   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed. Centre Opening Door. Minimum opening speed 2-1/2 FPS.                |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|          |           | Goods Elevators as described above for: Ayush  | 1   | Sets |          | 2,061,400 |                  | 2,061,400        |
| <b>4</b> | <b>MR</b> | <b>HOSPITAL PASSANGER (TRAUMA) ELEVATOR (MRL)</b>  |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/<br>architect   |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 1632   |     |      |          |           |                  |                  |
| 2.1      |           | Passanger: 24 Pax  |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Machine Room Less  |     |      |          |           |                  |                  |
| 6        |           | Operational Control:<br>Simplex Selective Collective.<br>Microprocessor-Based system   |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics: 415 +/- 10% Volts, 3 Phase, 50 Hertz  |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 2 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N / A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 2 Front - Telescopic Opening   |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to 1 floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 12.6 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2500 (W) x 3000 (D) <b>[Final dimension need to be coordinate<br/>with updated architectural plan.]</b>    |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2250 (W) x 2850 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm): 1200 (W) x 2400 (H)  |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
| 18       |           | Door Protection: Infrared Full Screen Curtain  |     |      |          |           |                  |                  |
| 19       |           | Guide Rails: High Strength Steel Class-A /Planed Steel Tees  |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1400 mm to 1600 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400mm to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.2  |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |



| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant: Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar   |     |      |          |           |                  |                  |
|          |           | Hospital passenger (Trauma) Elevators as described above for:<br>MRL 3flr  | 2   | Sets |          | 3,075,557 |                  | 6,151,114        |
| <b>5</b> | <b>MR</b> | <b>HOSPITAL PASSENGER ELEVATORS (WITH MACHINE ROOM)</b>  |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/<br>architect   |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 1768 Kgs   |     |      |          |           |                  |                  |
| 2.1      |           | Passanger: 26 Pax  |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with<br>Duplex/ Triplex Selective Collective. Microprocessor-Based<br>system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                                     |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 7 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 7 Front - Telescopic Opening   |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to 6th floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 30 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2500 (W) x 3000 (D) <b>[Final dimension need to be coordinate<br/>with updated architectural plan.]</b>                      |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2300 (W) x 2850 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>1200 (W) x 2400 (H)   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS.                   |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A / Planed Steel Tees  |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                                      |     |      |          |           |                  |                  |
|          |           | Hospital Passenger Elevators as described above for: IPD 7 flr   | 18  | Sets |          | 2,997,059 |                  | 53,947,062       |
| <b>6</b> | <b>MR</b> | <b>HOSPITAL PASSENGER ELEVATORS (WITH MACHINE ROOM)</b>  |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/ architect  |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 1768 Kgs   |     |      |          |           |                  |                  |
| 2.1      |           | Passanger: 26 Pax  |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with Duplex/ Triplex Selective Collective. Microprocessor-Based system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                               |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 8 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 8 Front - Telescopic Opening   |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Basement, Ground to 6th floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 33.6 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2500 (W) x 3000 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>                    |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>2300 (W) x 2850 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>1200 (W) x 2400 (H)   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed. Centre Opening Door. Minimum opening speed 2-1/2 FPS.                |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A / Planed Steel Tees  |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|          |           | Hospital Passenger Elevators as described above for: IPD 8flr  | 4   | Sets |          | 5,175,832 |                  | 20,703,328       |
| <b>5</b> | <b>MR</b> | <b>PASSENGER ELEVATORS (WITH MACHINE ROOM)</b>   |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client / architect   |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 1768 Kgs   |     |      |          |           |                  |                  |
| 2.1      |           | Passanger: 26 Pax  |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Duplex / Triplex Selective Collective.<br>Microprocessor-Based system as per site condition                         |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 2 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 2 Front - Telescopic Opening   |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to first floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 9 Mtrs. (approx.)   |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2250 (W) x 2550 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>        |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>1800 (W) x 2150 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>1100 (W) x 2400 (H)   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A / Planed Steel Tees  |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Steel Shell shall be Scratch proof & moon-rock as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31    |         | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|       |         | Passenger Elevators as described above for: Ayush 2flr   | 1   | Sets |          | 1,955,128 |                  | 1,955,128        |
| 7     | MR      | <b>PASSENGER ELEVATORS (MRL)</b>   |     |      |          |           |                  |                  |
|       |         | Number: Nomenclature of floors to be decided by the client / architect   |     |      |          |           |                  |                  |
|       |         | Capacity (kgs): 1428 Kgs   |     |      |          |           |                  |                  |
|       |         | Passanger: 21 Pax  |     |      |          |           |                  |                  |
|       |         | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
|       |         | Machine: Gearless  |     |      |          |           |                  |                  |
|       |         | Machine Location: Terrace  |     |      |          |           |                  |                  |
|       |         | Operational Control: Duplex Selective Collective. Microprocessor-Based system as per site condition                                      |     |      |          |           |                  |                  |
|       |         | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
|       |         | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
|       |         | Stops: 4 Front   |     |      |          |           |                  |                  |
|       |         | Emergency Landings: N/A  |     |      |          |           |                  |                  |
|       |         | Openings: 4 Front - Centre Opening   |     |      |          |           |                  |                  |
|       |         | Floors Served: Ground to 3th floors  |     |      |          |           |                  |                  |
|       |         | Travel height: 16.8 Mtrs. (approx.)  |     |      |          |           |                  |                  |
|       |         | Lift Well Size (W x D) mm:<br>2500 (W) x 3000 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>        |     |      |          |           |                  |                  |
|       |         | Minimum Clear Inside Car (mm):<br>2330 (W) x 2970 (D)  |     |      |          |           |                  |                  |
|       |         | Entrance Size (mm):<br>1200 (W) x 2400 (H)   |     |      |          |           |                  |                  |
|       |         | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
|       |         | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
|       |         | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
|       |         | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
|       |         | Buffers: Oil   |     |      |          |           |                  |                  |
|       |         | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | Car Enclosure:<br>Steel Shell shall be Scratch proof & moon-rock as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
|       |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
|       |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
|       |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
|       |         | Communication System: Three station intercom<br>Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Pit: 1400 mm - 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
|       |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
|       |         | Additional Features:   |     |      |          |          |                  |                  |
|       |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
|       |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
|       |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
|       |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
|       |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
|       |         | Load-Weighing Device   |     |      |          |          |                  |                  |
|       |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
|       |         | Bank Separation Operation  |     |      |          |          |                  |                  |
|       |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
|       |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
|       |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
|       |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
|       |         | Seismic Devices.   |     |      |          |          |                  |                  |
|       |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
|       |         | Regenerative Braking   |     |      |          |          |                  |                  |
|       |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
|       |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
|       |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
|       |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |



| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
|          |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|          |           | Passenger Elevators as described above for: 4flr   | 2   | Sets |          | 2,186,668 |                  | 4,373,336        |
| <b>8</b> | <b>MR</b> | <b>PASSENGER ELEVATORS (MRL)</b>   |     |      |          |           |                  |                  |
|          |           | Number: Nomenclature of floors to be decided by the client / architect   |     |      |          |           |                  |                  |
|          |           | Capacity (kgs): 1428 Kgs   |     |      |          |           |                  |                  |
|          |           | Passanger: 21 Pax  |     |      |          |           |                  |                  |
|          |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
|          |           | Machine: Gearless  |     |      |          |           |                  |                  |
|          |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
|          |           | Operational Control: Duplex Selective Collective. Microprocessor-Based system as per site condition                                      |     |      |          |           |                  |                  |
|          |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
|          |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
|          |           | Stops: 5 Front   |     |      |          |           |                  |                  |
|          |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
|          |           | Openings: 5 Front - Centre Opening   |     |      |          |           |                  |                  |
|          |           | Floors Served: Ground to 4th floors  |     |      |          |           |                  |                  |
|          |           | Travel height: 21 Mtrs. (approx.)  |     |      |          |           |                  |                  |
|          |           | Lift Well Size (W x D) mm:<br>2500 (W) x 3000 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>        |     |      |          |           |                  |                  |
|          |           | Minimum Clear Inside Car (mm):<br>2330 (W) x 2970 (D)  |     |      |          |           |                  |                  |
|          |           | Entrance Size (mm):<br>1200 (W) x 2400 (H)   |     |      |          |           |                  |                  |
|          |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
|          |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
|          |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
|          |           | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
|          |           | Buffers: Oil   |     |      |          |           |                  |                  |
|          |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | Car Enclosure:<br>Steel Shell shall be Scratch proof & moon-rock as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
|       |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
|       |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
|       |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
|       |         | Communication System: Three station intercom<br>Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Pit: 1400 mm - 1450 mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
|       |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
|       |         | Additional Features:   |     |      |          |          |                  |                  |
|       |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
|       |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
|       |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
|       |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
|       |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
|       |         | Load-Weighing Device   |     |      |          |          |                  |                  |
|       |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
|       |         | Bank Separation Operation  |     |      |          |          |                  |                  |
|       |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
|       |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
|       |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
|       |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
|       |         | Seismic Devices.   |     |      |          |          |                  |                  |
|       |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
|       |         | Regenerative Braking   |     |      |          |          |                  |                  |
|       |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
|       |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
|       |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
|       |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
|          |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|          |           | Hospital Passenger Elevators as described above for: 5 flrs  | 3   | Sets |          | 2,418,208 |                  | 7,254,624        |
| <b>9</b> | <b>MR</b> | <b>PASSENGER ELEVATORS (WITH MACHINE ROOM)</b>   |     |      |          |           |                  |                  |
|          |           | Number: Nomenclature of floors to be decided by the client / architect   |     |      |          |           |                  |                  |
|          |           | Capacity (kgs): 1428 Kgs   |     |      |          |           |                  |                  |
|          |           | Passanger: 21 Pax  |     |      |          |           |                  |                  |
|          |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
|          |           | Machine: Gearless  |     |      |          |           |                  |                  |
|          |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
|          |           | Operational Control: Duplex / Triplex Selective Collective.<br>Microprocessor-Based system as per site condition                         |     |      |          |           |                  |                  |
|          |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
|          |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
|          |           | Stops: 3 Front   |     |      |          |           |                  |                  |
|          |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
|          |           | Openings: 3 Front - Telescopic Opening   |     |      |          |           |                  |                  |
|          |           | Floors Served: Ground to Second floors   |     |      |          |           |                  |                  |
|          |           | Travel height: 13.2 Mtrs. (approx.)  |     |      |          |           |                  |                  |
|          |           | Lift Well Size (W x D) mm:<br>2250 (W) x 2550 (D) [Final dimension need to be coordinate with updated architectural plan.]               |     |      |          |           |                  |                  |
|          |           | Minimum Clear Inside Car (mm):<br>1800 (W) x 2150 (D)  |     |      |          |           |                  |                  |
|          |           | Entrance Size (mm):<br>1100 (W) x 2400 (H)   |     |      |          |           |                  |                  |
|          |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
|          |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
|          |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
|          |           | Guide Rails:<br>High Strength Steel Class-A / Planed Steel Tees  |     |      |          |           |                  |                  |
|          |           | Buffers: Oil   |     |      |          |           |                  |                  |
|          |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
|       |         | Car Enclosure:<br>Steel Shell shall be Scratch proof & moon-rock as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
|       |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
|       |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
|       |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
|       |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
|       |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
|       |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
|       |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
|       |         | Additional Features:   |     |      |          |          |                  |                  |
|       |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
|       |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
|       |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
|       |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
|       |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
|       |         | Load-Weighing Device   |     |      |          |          |                  |                  |
|       |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
|       |         | Bank Separation Operation  |     |      |          |          |                  |                  |
|       |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
|       |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
|       |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
|       |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
|       |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
|       |         | Seismic Devices.   |     |      |          |          |                  |                  |
|       |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
|       |         | Regenerative Braking   |     |      |          |          |                  |                  |
|       |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
|       |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
|       |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
|       |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
|          |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                          |     |      |          |           |                  |                  |
|          |           | Hospital Passenger Elevators as described above for: 3 flr   | 3   | Sets |          | 2,070,898 |                  | 6,212,694        |
| <b>5</b> | <b>MR</b> | <b>PASSENGER ELEVATORS (WITH MACHINE ROOM)</b>   |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client / architect   |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 1768 Kgs   |     |      |          |           |                  |                  |
| 2.1      |           | Passanger: 26 Pax  |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 1.0  |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Duplex / Triplex Selective Collective.<br>Microprocessor-Based system as per site condition                         |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                   |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 3 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 5 Front - Telescopic Opening   |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to 2nd floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 13.2 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2250 (W) x 2550 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>        |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>1800 (W) x 2150 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>1100 (W) x 2400 (H)   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS. |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A / Planed Steel Tees  |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Steel Shell shall be Scratch proof & moon-rock as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passangers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar  |     |      |          |           |                  |                  |
|          |           | Passenger Elevators as described above for: 3flr 26pax   | 1   | Sets |          | 2,373,026 |                  | 2,373,026        |
| <b>3</b> | <b>MR</b> | <b>GOODS ELEVATORS (WITH MACHINE ROOM)</b>   |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/<br>architect   |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 2000 Kgs   |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 0.55   |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with<br>Duplex/ Triplex Selective Collective. Microprocessor-Based<br>system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                                     |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 5 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 5 Front - Cnetral Opening  |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to 4th floors  |     |      |          |           |                  |                  |
| 12       |           | Travel height: 21 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2250 (W) x 2550 (D) <b>[Final dimension need to be coordinate<br/>with updated architectural plan.]</b>                      |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>1800 (W) x 2150 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>As per CPWD   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed.<br>Centre Opening Door. Minimum opening speed 2-1/2 FPS.                   |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |



| S. No    | Code No   | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|-----------|--|-----|------|----------|-----------|------------------|------------------|
| 1        | 1A        | 2  | 3   | 4    | 5        | 6         | 7                | 8                |
| 31       |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar                                      |     |      |          |           |                  |                  |
|          |           | Goods Elevators as described above for: 5flr   | 1   | Sets |          | 2,834,980 |                  | 2,834,980        |
| <b>3</b> | <b>MR</b> | <b>GOODS ELEVATORS (WITH MACHINE ROOM)</b>   |     |      |          |           |                  |                  |
| 1        |           | Number: Nomenclature of floors to be decided by the client/ architect  |     |      |          |           |                  |                  |
| 2        |           | Capacity (kgs): 2000 Kgs   |     |      |          |           |                  |                  |
| 3        |           | Contract Speed (m/s): 0.55   |     |      |          |           |                  |                  |
| 4        |           | Machine: Gearless  |     |      |          |           |                  |                  |
| 5        |           | Machine Location: Terrace  |     |      |          |           |                  |                  |
| 6        |           | Operational Control: Individual landing operating panel with Duplex/ Triplex Selective Collective. Microprocessor-Based system as per site condition |     |      |          |           |                  |                  |
| 7        |           | Motor Control:<br>AC Variable Voltage<br>Variable Frequency<br>Microprocessor Based with Digital Closed Loop Feedback.                               |     |      |          |           |                  |                  |
| 8        |           | Power Characteristics:<br>415 +/- 10% Volts, 3 Phase, 50 Hertz   |     |      |          |           |                  |                  |
| 9a.      |           | Stops: 3 Front   |     |      |          |           |                  |                  |
| 9b.      |           | Emergency Landings: N/A  |     |      |          |           |                  |                  |
| 10       |           | Openings: 3 Front - Central Opening  |     |      |          |           |                  |                  |
| 11       |           | Floors Served: Ground to Second floors   |     |      |          |           |                  |                  |
| 12       |           | Travel height: 13.2 Mtrs. (approx.)  |     |      |          |           |                  |                  |
| 13       |           | Lift Well Size (W x D) mm:<br>2250 (W) x 2550 (D) <b>[Final dimension need to be coordinate with updated architectural plan.]</b>                    |     |      |          |           |                  |                  |
| 14       |           | Minimum Clear Inside Car (mm):<br>1800 (W) x 2150 (D)  |     |      |          |           |                  |                  |
| 15       |           | Entrance Size (mm):<br>As per CPWD   |     |      |          |           |                  |                  |
| 16       |           | Landing Door Fire Rating: 1 hr. (as per NBC)   |     |      |          |           |                  |                  |
| 17       |           | Door Operation:<br>High Speed, Heavy-Duty Door Operator. Adjustable Door Speed. Centre Opening Door. Minimum opening speed 2-1/2 FPS.                |     |      |          |           |                  |                  |
| 18       |           | Door Protection:<br>Infrared Full Screen Curtain   |     |      |          |           |                  |                  |
| 19       |           | Guide Rails:<br>High Strength Steel Class-A/ Planed Steel Tees   |     |      |          |           |                  |                  |
| 20       |           | Buffers: Oil   |     |      |          |           |                  |                  |
| 21       |           | Compensation: Provider's standard application  |     |      |          |           |                  |                  |

| S. No | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 7                | 8                |
| 22    |         | Car Enclosure:<br>Stainless Steel Shell shall be Scratch proof as specified Plus 300 kg (minimum) Weight Allowance for Interior Finishes.<br>2300 mm Clear Height Under the Canopy (bare).<br>Battery Powered Emergency Car Lighting.<br>Illuminate portion of normal car lighting. Landing Doors & Car Doors to be Scratch proof, moon-rock factory finished. Samples of finishes to be approved by the client. |     |      |          |          |                  |                  |
| 23    |         | Signal Fixtures: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 24    |         | Hall & Car Pushbutton Stations: Two numbers of car operating panels in each car. One Hall operating panel in between two cars.   |     |      |          |          |                  |                  |
| 25    |         | Hall Car Position Indicators: Required   |     |      |          |          |                  |                  |
| 26    |         | Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction   |     |      |          |          |                  |                  |
| 27    |         | Communication System: Three station intercom   |     |      |          |          |                  |                  |
| 28    |         | Fixture submittal: Provider's Premium Design.  |     |      |          |          |                  |                  |
| 29    |         | Pit: 1450 mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).   |     |      |          |          |                  |                  |
| 29.1  |         | Over Head: 4400 to 4500mm - Minimum car floor area shall be as per relevant IS codes passengers elevator (Vendor to confirm).  |     |      |          |          |                  |                  |
| 30    |         | Additional Features:   |     |      |          |          |                  |                  |
| 30.1  |         | Car & Counterweight Roller Guides  |     |      |          |          |                  |                  |
| 30.2  |         | Car Top Inspection Station   |     |      |          |          |                  |                  |
| 30.3  |         | Fire-fighter's service,  |     |      |          |          |                  |                  |
| 30.4  |         | Accessibility Signage (Braille Buttons)  |     |      |          |          |                  |                  |
| 30.5  |         | Hoist Way Door Unlocking Device,<br>All Floors.  |     |      |          |          |                  |                  |
| 30.6  |         | Load-Weighing Device   |     |      |          |          |                  |                  |
| 30.7  |         | Anti-Nuisance Feature.   |     |      |          |          |                  |                  |
| 30.8  |         | Bank Separation Operation  |     |      |          |          |                  |                  |
| 30.9  |         | Independent Floor Lock Off Feature   |     |      |          |          |                  |                  |
| 30.1  |         | Provision for CCTV in All Cars.  |     |      |          |          |                  |                  |
| 30.11 |         | Provision for Card Reader for Access Control inside all Cars.  |     |      |          |          |                  |                  |
| 30.12 |         | Provision for WI-FI and Voice connectivity for mobiles.  |     |      |          |          |                  |                  |
| 30.13 |         | Fire-fighters Control Panel & Remote Wiring.   |     |      |          |          |                  |                  |
| 30.14 |         | One Year Warranty Maintenance with 24- Hour Call Back Service.   |     |      |          |          |                  |                  |
| 30.15 |         | Seismic Devices.   |     |      |          |          |                  |                  |
| 30.16 |         | Microswitch LED buttons. Nomenclature of the buttons to be decided by the client   |     |      |          |          |                  |                  |
| 30.17 |         | Regenerative Braking   |     |      |          |          |                  |                  |
| 30.18 |         | Automatic Rescue Device  |     |      |          |          |                  |                  |
| 30.19 |         | Stainless Steel Hand Rails on Rear panel.  |     |      |          |          |                  |                  |
| 30.20 |         | Wiring Diagrams, Operating Instructions and Parts Ordering Information.  |     |      |          |          |                  |                  |
| 30.21 |         | System Diagnostic Means and Instructions.  |     |      |          |          |                  |                  |

| S. No     | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items   |
|-----------|-----------|---|-----|------|----------|-----------|------------------|--------------------|
| 1         | 1A        | 2   | 3   | 4    | 5        | 6         | 7                | 8                  |
| 31        |           | GREEN BUILDINGS Compliant:<br>Lifts should be disabled friendly:<br>a. Braille<br>b. Audio-Video<br>c. Grab Bar   |     |      |          |           |                  |                    |
|           |           | Goods Elevators as described above for: 3flr  | 2   | Sets |          | 2,256,130 |                  | 4,512,260          |
| Notes:    |           | 1. Power for erection, testing & commissioning shall be arranged by the lift vendor.  |     |      |          |           |                  |                    |
|           |           | 2. Necessary scaffolding for execution to be arranged by lift vendor.   |     |      |          |           |                  |                    |
|           |           | 3. Control cabling and panel shall be including with lift items.  |     |      |          |           |                  |                    |
|           |           | 4. Refer to Architectural / Structural drawings before quoting  |     |      |          |           |                  |                    |
|           |           | 5. This BOQ is based on Architectural drawings  |     |      |          |           |                  |                    |
|           |           | 6. Before quoting, vendor to check all the parameters i.e. lift shaft size, total number of openings, number of stops, travels heights, machine room or without machine room, finishing of lifts, interior layouts.   |     |      |          |           |                  |                    |
|           |           | 7. Vendor to submit complete traffic analysis and get the approval on the from client / architect / structural consultant / MEP consultant.   |     |      |          |           |                  |                    |
|           |           | 8. Vendor to submit shop drawings and get the approval from client, architects, structural consultants & MEP consultants before start execution at site.  |     |      |          |           |                  |                    |
|           |           | <b>TOTAL CARRIED OVER TO SUMMARY</b>  |     |      |          |           | -                | <b>139,062,610</b> |
| <b>T.</b> | <b>MR</b> | <b>AVIATION OBSTRUCTION LIGHT</b>   |     |      |          |           |                  |                    |
|           |           | Aviation Obstruction Light: (It shall essentially meet ICAO, DARA & Govt. Civil Aviation Deptt. Standards)  |     |      |          |           |                  |                    |
|           |           | Design, supply & installation of Aviation Obstruction Light System 'Binay' make or equivalent as approved Aviation obstruction light with LED light source, with Flasher complete as per the requirement of Aviation Department of Govt. of India for the site in consideration including providing all fixing accessories: |     |      |          |           |                  |                    |
|           |           | <b>Low Intensity (mounting height: below 45M)</b>   |     |      |          |           |                  |                    |
|           |           | LED Based Aviation Obstruction Light (AOL) for below 45M of mounting height (Low Intensity) with a minimum (radial, in each & every direction, over 360°) intensity of 10 Candela in RED.   |     |      |          |           |                  |                    |

| S. No                                | Code No   | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------------------------------------|-----------|---|-----|------|----------|----------|------------------|------------------|
| 1                                    | 1A        | 2   | 3   | 4    | 5        | 6        | 7                | 8                |
|                                      |           | <p>The lamp shall have normal continuous life of not less than 100,000 burning hours with light depreciation not more than 50% at end of life, shall be shock proof, vibration resistant &amp; ability to withstand voltage fluctuations &amp; with improved power factor. LED lights shall be provided with EMI/ RFI filters.</p> <p>The design of LED's shall be failsafe, redundancy built-in with multiple series parallel circuits.</p> <p>The AOL shall be rugged heavy duty construction made in LM-6 alloy cast steel and shall be sealed against duct &amp; water ingress (IP 65). The dome shall be made with toughened clear borosilicate hard glass. LED's shall be able to withstand extreme temperature &amp; humidity conditions and construction of dome shall be UV protected.</p> <p>The AOL shall be as per civil Aviation Ministry's guide lines for the site / area under consideration. It shall be suitable for 230V, 1 phase AC supply. Maximum wattage shall be 15 watts. Fixture shall be complete with earthing terminals.</p> | 20  | Set  |          | 18,909   |                  | 378,180          |
| <b>TOTAL CARRIED OVER TO SUMMARY</b> |           |   |     |      |          |          | -                | <b>378,180</b>   |
| <b>U.</b>                            |           | <b>ACCESS CONTROL SYSTEM</b>  |     |      |          |          |                  |                  |
|                                      |           | Design, supply, installation, testing & commissioning of following Access Control System & complete as required at site:  |     |      |          |          |                  |                  |
| <b>I</b>                             | <b>MR</b> | <b>Access Intelligent Controllers (AIC)</b>   |     |      |          |          |                  |                  |
| 1                                    |           | Supply, installation, testing and commissioning of Access Intelligent Controller support 2 standard Weigand Interface or up to 8 Input & 4 Output port as per the specification with enclosure, power supply & Maintenance free Batteries with 30 minutes back up. The controller should be minimum 32 bit embedded microprocessor chip and on board TCP/ IP as per the Specification. The Controller Should have flash Memory, can store 55000 Card holder & 45000 transactions in offline mode, FCC, CE & complete as per the specifications.   | 6   | Nos. |          | 51,853   |                  | 311,118          |
| <b>II</b>                            | <b>MR</b> | <b>Readers, Cards &amp; Tags</b>  |     |      |          |          |                  |                  |
| 1                                    |           | Supply, installation, testing and commissioning Short Range Proximity Reader complete as per the specifications.  | 6   | Nos. |          | 11,200   |                  | 67,200           |
| 2                                    | <b>MR</b> | Supply, installation, testing and commissioning Biometric Finger with Smart card (Read range Up to 9 cm) & PIN Pad Reader at Every Entry Access Doors as per the Specification.   | 6   | Nos. |          | 71,126   |                  | 426,756          |
| <b>III</b>                           | <b>MR</b> | <b>Access Control Intrgrated Software</b>   |     |      |          |          |                  |                  |

| S. No     | Code No | Item Description  | Qty  | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-----------|---------|---|------|-------|----------|----------|------------------|------------------|
| 1         | 1A      | 2   | 3    | 4     | 5        | 6        | 7                | 8                |
| 1         |         | Supply, installation, testing and commissioning Access Control Software consisting of Access Control system, Access Alarm Document with 1 client License, Graphical layout as per the specifications.                                   | 1    | No.   |          | 115,706  |                  | 115,706          |
| <b>IV</b> |         | <b>Misc Other Items for Access Control System :</b>   |      |       |          |          |                  |                  |
| 1         | MR      | Supply, installation, testing & commissioning of Electro Magnetic Lock with inbuilt door feedback of Suitable Capacity (Min 600 lbs) with all required brackets for glass/ Wooden doors as per specifications.                          |      |       |          |          |                  |                  |
| 1a.       |         | Single Leaf EM Lock   | 6    | Nos   |          | 8,145    |                  | 48,870           |
| 1b.       |         | Double Leaf EM Lock   | 20   | Nos.  |          | 12,945   |                  | 258,900          |
| 2         | MR      | Supply, installation, testing & commissioning of Managed Layer -2 Switch with 8 no's 10/ 100 base Tx maximum power consumption 135 watt.  | 4    | Nos.  |          | 32,945   |                  | 131,780          |
| 3         | MR      | Supply, Installation, testing & commissioning of Break Glass unit (BGU) as per the specifications.  | 6    | Nos.  |          | 945      |                  | 5,670            |
| 4         | MR      | Supply, installation, testing and commissioning of Exit Push Button for Access Doors.   | 6    | Nos.  |          | 800      |                  | 4,800            |
| 5         | MR      | Supply, installation, testing and commissioning of Magenetic contact for Access Doors.  | 70   | Nos.  |          | 800      |                  | 56,000           |
| 6         | MR      | Supply, Installation, testing & commissioning of 12VDC 8 AMP Lock Power supply as per the specification.  | 4    | Nos.  |          | 5,658    |                  | 22,632           |
| 7         | MR      | Supply and Laying of 8 Core x 1 sq mm multi strand, copper, unarmoured sheilded Cable as per specification (between the every card readers & the access controllers) in 25mm dia existing PVC conduits.                                 | 1040 | RM    |          | 134      |                  | 139,360          |
| 8         | MR      | Supply and Laying of 4 Core x 1 Sq mm, multi strand, copper, sheilded, un armoured cable as per specification (between the controller and EM Lock/ door sensor/ Request to exit button and) in 25mm dia existing PVC conduits.          | 200  | RM    |          | 128      |                  | 25,600           |
| 9         | MR      | Supply and Laying of 2 Core x 1.5 Sq mm, multi strand, copper, sheilded, un armoured cable as per specification.  | 200  | RM    |          | 99       |                  | 19,800           |
| 10        | MR      | Supply & laying of Cat 6 Cable in 25mm dia existing PVC conduits.   | 200  | RM    |          | 51       |                  | 10,200           |
| 11        | 1.20    | Supplying and fixing of following sizes of steel conduit along with accessories in surface/ recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. |      |       |          |          |                  |                  |
| 11.1      | 1.20.2  | 25 mm   | 1200 | Meter | 147      |          | 176,400          |                  |

| S. No    | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|----------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1        | 1A      | 2   | 3   | 4    | 5        | 6          | 7                | 8                |
|          |         | <b>TOTAL CARRIED OVER TO SUMMARY</b>  |     |      |          |            | <b>176,400</b>   | <b>1,644,392</b> |
| 20.0     |         | <b>AUDIO-VISUAL SYSTEM</b>  |     |      |          |            |                  |                  |
| 20.1     |         | <b>Audio Visual Systems of Typical 10 Pax Conference Room (2 No's)</b>  |     |      |          |            |                  |                  |
| 20.1.1   |         | <b>Audio System</b>   |     |      |          |            |                  |                  |
| 20.1.1.1 | MR      | SITC of Table Top Audio Conference Unit with Wired Microphone Kit , spec A-40   | 2   | No's |          | 119,425.18 |                  | 238,850.35       |
| 20.1.2   |         | <b>Video System</b>   |     |      |          |            |                  |                  |
| 20.1.2.1 | MR      | SITC of 65" Full HD LED Display with minimum 350 Cd/m2, HDMI X 2, DVI X 1, VGA X 1, RS232 X 1, Video IN X 1, RJ45 LAN X 1, Audio IN X 1, Audio Out x 1, 20W in built speakers, USB Media player, landscape/portrait installation, 16 hours/day operation, spec B-3  | 2   | No's |          | 238,559.53 |                  | 477,119.05       |
| 20.1.2.2 | MR      | SITC of Universal flat screen wall mount bracket with tilt supports minimum 70Kgs weight up to 80" display, spec B-4  | 2   | No's |          | 10,808.52  |                  | 21,617.04        |
| 20.1.2.3 | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35   | 2   | No's |          | 2,246.79   |                  | 4,493.57         |
| 20.1.2.4 | MR      | SITC of 7.6mtr Standard HDMI (M) to HDMI (M) Cable, spec B-38   | 2   | No's |          | 4,972.58   |                  | 9,945.16         |
| 20.1.3   |         | <b>Installation Equipment</b>   |     |      |          |            |                  |                  |
| 20.1.3.1 | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1   | 2   | No's |          | 2,819.32   |                  | 5,638.63         |
| 20.2     |         | <b>Audio Visual Systems of Board Room</b>   |     |      |          |            |                  |                  |
| 20.2.1   |         | <b>Audio System</b>   |     |      |          |            |                  |                  |
| 20.2.1.1 | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1  | 2   | No's |          | 9,705.66   |                  | 19,411.31        |
| 20.2.1.2 | MR      | SITC of Condenser Cardioid Boundary Microphone capsule with necessary mounting Accessories along with LED Ring with indicators & Push button for microphones , spec A-2   | 9   | No's |          | 27,159.87  |                  | 244,438.80       |
| 20.2.1.3 | MR      | SITC of Audio DSP with minimum 12 Mic/Line In, 8 Out should be able interconnected via AVB / Dante, with VOIP interface, necessary expanders/required no. of additional DSP's and accessories with sufficient Logic I/O ports/Box compatible with the DSP, spec A-3 | 1   | No's |          | 349,126.44 |                  | 349,126.44       |
| 20.2.1.4 | MR      | SITC of 2 Channel Amplifier with minimum 15-25 Watts per Channel @ 8/4 Ohms, spec A-26  | 1   | No's |          | 24,813.86  |                  | 24,813.86        |
| 20.2.2   |         | <b>Video System</b>   |     |      |          |            |                  |                  |
| 20.2.2.1 | MR      | SITC of 94" Diagonal Motorized projection screen with minimum 100 to 400mm black drop and LVC, spec B-7   | 1   | No's |          | 97,467.13  |                  | 97,467.13        |
| 20.2.2.2 | MR      | SITC of 3500 -4000 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens, spec B-12  | 1   | No's |          | 263,172.66 |                  | 263,172.66       |
| 20.2.2.3 | MR      | SITC of Minimum 8x4 HDMI Matrix switcher with RS232 , Ethernet & IR with necessary Extenders / Converters and mounting accessories, spec B-15   | 1   | No's |          | 297,760.60 |                  | 297,760.60       |
| 20.2.2.4 | MR      | SITC of HDMI Audio De-embedder, spec B-30   | 1   | No's |          | 48,724.44  |                  | 48,724.44        |
| 20.2.2.5 | MR      | SITC of Wireless Presentation Box, spec B-31  | 1   | No's |          | 62,785.67  |                  | 62,785.67        |
| 20.2.2.6 | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34   | 10  | No's |          | 1,950.26   |                  | 19,502.55        |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.2.2.7  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 3   | No's |          | 2,246.79   |                  | 6,740.36         |
| 20.2.2.8  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 2   | No's |          | 2,725.80   |                  | 5,451.59         |
| 20.2.2.9  | MR      | SITC of 4.6mtr Standard HDMI (M) to HDMI (M) Cable, spec B-37  | 1   | No's |          | 3,120.41   |                  | 3,120.41         |
| 20.2.2.10 | MR      | SITC of 7.6mtr Standard HDMI (M) to HDMI (M) Cable, spec B-38  | 2   | No's |          | 4,972.58   |                  | 9,945.16         |
| 20.2.2.11 | MR      | SITC of 10.7mtr Standard HDMI (M) to HDMI (M) Cable, spec B-39   | 2   | No's |          | 7,209.10   |                  | 14,418.20        |
| 20.2.2.12 | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40   | 1   | No's |          | 15,493.69  |                  | 15,493.69        |
| 20.2.3    |         | <b>Control System</b>  |     |      |          |            |                  |                  |
| 20.2.3.1  | MR      | SITC of 7" wired Touch panel with Table top docking station , spec C-1   | 1   | No's |          | 112,788.61 |                  | 112,788.61       |
| 20.2.3.2  | MR      | SITC of Integrated Control Processor with minimu, 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support, spec C-3 | 1   | No's |          | 148,879.73 |                  | 148,879.73       |
| 20.2.3.3  | MR      | SITC of POE Injector, spec C-6   | 1   | No's |          | 8,270.91   |                  | 8,270.91         |
| 20.2.4    |         | <b>Video Conference System</b>   |     |      |          |            |                  |                  |
| 20.2.4.1  | MR      | SITC Of Codec with 12x HD Camera and Remote control,1HDMI,1 HDMI or DVI-I selectable inputs with 2HDMI outputs, spec D-1   | 1   | No's |          | 790,926.49 |                  | 790,926.49       |
| 20.2.4.2  | MR      | SITC of License with MultiSite Option , spec D-2   | 1   | No's |          | 263,642.54 |                  | 263,642.54       |
| 20.2.5    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.2.5.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1  | 3   | No's |          | 2,819.32   |                  | 8,457.95         |
| 20.2.5.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 1   | No's |          | 4,700.00   |                  | 4,700.00         |
| 20.2.5.3  | MR      | SITC of 12 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required , spec E-4  | 2   | No's |          | 14,098.86  |                  | 28,197.72        |
| 20.3      |         | <b>Audio Visual Systems of Medical Lecture Theatre (Single Height)</b>   |     |      |          |            |                  |                  |
| 20.3.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.3.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1                                       | 15  | No's |          | 9,705.66   |                  | 145,584.83       |
| 20.3.1.2  | MR      | SITC of Audio DSP with minimum 8 input and 6 out put with RS 232 control, spec A-4   | 1   | No's |          | 143,804.50 |                  | 143,804.50       |
| 20.3.1.3  | MR      | SITC of 15.7" Condenser Gooseneck Microphone with Shock Mount, spec A-12   | 1   | No's |          | 42,925.00  |                  | 42,925.00        |
| 20.3.1.4  | MR      | SITC of Wireless Microphone Receiver with Lavalier Microphone - 30mw RF output, spec A-13  | 1   | No's |          | 44,409.93  |                  | 44,409.93        |
| 20.3.1.5  | MR      | SITC of UHF Wireless Handheld Microphone with Receiver - 30mw Power Output , spec A-14   | 2   | No's |          | 41,590.61  |                  | 83,181.23        |
| 20.3.1.6  | MR      | SITC of Antenna Splitter in the frequency range of 470 to 790 MHz and with two antenna inputs that are distributed to minimum four outputs, spec A-15                | 1   | No's |          | 69,082.37  |                  | 69,082.37        |
| 20.3.1.7  | MR      | SITC of 8 Channel Amplifier 60 / 75 Watts @ 8/4 Ohms, spec A-29  | 1   | No's |          | 218,485.59 |                  | 218,485.59       |
| 20.3.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.3.2.1  | MR      | SITC of 137" Diagonal Motorized projection sceern with minimum 200mm black drop and LVC, spec B-9  | 2   | No's |          | 109,611.17 |                  | 219,222.35       |
| 20.3.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13                                       | 2   | No's |          | 122,187.47 |                  | 244,374.94       |
| 20.3.2.3  | MR      | SITC of 4 X 4 HDMI matrix switcher, spec B-17  | 1   | No's |          | 131,586.33 |                  | 131,586.33       |
| 20.3.2.4  | MR      | SITC of HDMI Cat5e Box Type Transmitter runs up to 70mtr , spec B-27   | 4   | No's |          | 18,121.40  |                  | 72,485.62        |
| 20.3.2.5  | MR      | SITC of HDMI over Cat5e Box Type receiver runs up to 70mtr , spec B-28   | 4   | No's |          | 18,121.40  |                  | 72,485.62        |
| 20.3.2.6  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 2   | No's |          | 48,724.44  |                  | 97,448.88        |
| 20.3.2.7  | MR      | SITC of Wirless Presentation Box, spec B-31  | 1   | No's |          | 62,785.67  |                  | 62,785.67        |
| 20.3.2.8  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 6   | No's |          | 1,950.26   |                  | 11,701.53        |
| 20.3.2.9  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 2   | No's |          | 2,246.79   |                  | 4,493.57         |
| 20.3.2.10 | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40   | 2   | No's |          | 15,832.42  |                  | 31,664.84        |
| 20.3.2.11 | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 2   | No's |          | 8,948.36   |                  | 17,896.73        |
| 20.3.3    |         | <b>Control System System</b>   |     |      |          |            |                  |                  |
| 20.3.3.1  | MR      | SITC of 10" wired touch panel with Table top docking station , spec C-2  | 1   | No's |          | 219,259.98 |                  | 219,259.98       |
| 20.3.3.2  | MR      | SITC of Integrated Control Processor with minimu, 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support, spec C-3 | 1   | No's |          | 148,879.73 |                  | 148,879.73       |
| 20.3.3.3  | MR      | SITC of POE Injector, spec C-6   | 1   | No's |          | 8,270.91   |                  | 8,270.91         |
| 20.3.4    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.3.4.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1  | 1   | No's |          | 2,819.32   |                  | 2,819.32         |
| 20.3.4.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 2   | No's |          | 4,700.00   |                  | 9,400.00         |
| 20.3.4.3  | MR      | SITC of 18 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required , spec E-5  | 1   | No's |          | 18,797.72  |                  | 18,797.72        |
| 20.4      |         | <b>Audio Visual Systems of Typical Medical Lecture Theatre (Double Height) - 3 No's</b>  |     |      |          |            |                  |                  |
| 20.4.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.4.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1                                       | 45  | No's |          | 9,705.66   |                  | 436,754.48       |
| 20.4.1.2  | MR      | SITC of Audio DSP with minimum 8 input and 6 out put with RS 232 control, spec A-4   | 3   | No's |          | 143,804.50 |                  | 431,413.51       |
| 20.4.1.3  | MR      | SITC of 15.7" Condenser Gooseneck Microphone with Shock Mount, spec A-12   | 3   | No's |          | 42,925.00  |                  | 128,775.00       |
| 20.4.1.4  | MR      | SITC of Wireless Microphone Receiver with Lavalieri Microphone - 30mw RF output, spec A-13   | 3   | No's |          | 44,409.93  |                  | 133,229.79       |
| 20.4.1.5  | MR      | SITC of UHF Wireless Handheld Microphone with Receiver - 30mw Power Output , spec A-14   | 6   | No's |          | 41,590.61  |                  | 249,543.68       |



| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.4.1.6  | MR      | SITC of Antenna Splitter in the frequency range of 470 to 790 MHz and with two antenna inputs that are distributed to minimum four outputs, spec A-15                | 3   | No's |          | 69,082.37  |                  | 207,247.10       |
| 20.4.1.7  | MR      | Omni Directional Antenna UHF range between 470 to 790 MHz includes antenna amplifier, mounting kit & necessary Antenna cable, spec A-18                              | 6   | No's |          | 69,632.09  |                  | 417,792.52       |
| 20.4.1.7  | MR      | SITC of 8 Channel Amplifier 60 / 75 Watts @ 8/4 Ohms, spec A-29  | 3   | No's |          | 218,485.59 |                  | 655,456.76       |
| 20.4.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.4.2.1  | MR      | SITC of 137" Diagonal Motorized projection sceern with minimum 600mm black drop and LVC, spec B-10   | 6   | No's |          | 109,611.17 |                  | 657,667.04       |
| 20.4.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13                                       | 6   | No's |          | 122,187.47 |                  | 733,124.81       |
| 20.4.2.3  | MR      | SITC of 4 X 4 HDMI matrix switcher, spec B-17  | 3   | No's |          | 131,586.33 |                  | 394,758.98       |
| 20.4.2.4  | MR      | SITC of HDMI Cat5e Box Type Transmitter runs up to 70mtr , spec B-27   | 12  | No's |          | 18,121.40  |                  | 217,456.85       |
| 20.4.2.5  | MR      | SITC of HDMI over Cat5e Box Type receiver runs up to 70mtr , spec B-28   | 12  | No's |          | 18,121.40  |                  | 217,456.85       |
| 20.4.2.6  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 6   | No's |          | 48,724.44  |                  | 292,346.65       |
| 20.4.2.7  | MR      | SITC of Wirless Presentation Box, spec B-31  | 3   | No's |          | 62,785.67  |                  | 188,357.00       |
| 20.4.2.8  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 18  | No's |          | 1,950.26   |                  | 35,104.59        |
| 20.4.2.9  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 6   | No's |          | 2,246.79   |                  | 13,480.71        |
| 20.4.2.10 | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40   | 6   | No's |          | 15,832.42  |                  | 94,994.53        |
| 20.4.2.11 | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 6   | No's |          | 8,948.36   |                  | 53,690.18        |
| 20.4.3    |         | <b>Control System System</b>   |     |      |          |            |                  |                  |
| 20.4.3.1  | MR      | SITC of 10" wired touch panel with Table top docking station , spec C-2  | 3   | No's |          | 219,259.98 |                  | 657,779.95       |
| 20.4.3.2  | MR      | SITC of Integrated Control Processor with minimu, 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support, spec C-3 | 3   | No's |          | 148,879.73 |                  | 446,639.19       |
| 20.4.3.3  | MR      | SITC of POE Injector, spec C-6   | 3   | No's |          | 8,270.91   |                  | 24,812.72        |
| 20.4.4    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.4.4.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1  | 3   | No's |          | 2,819.32   |                  | 8,457.95         |
| 20.4.4.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 6   | No's |          | 4,700.00   |                  | 28,200.00        |
| 20.4.4.3  | MR      | SITC of 18 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required , spec E-5  | 3   | No's |          | 18,797.72  |                  | 56,393.16        |
| 20.5      |         | <b>Audio Visual Systems of Typical Nursing Class Room - 2 No's</b>   |     |      |          |            |                  |                  |
| 20.5.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.5.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1                                       | 12  | No's |          | 9,705.66   |                  | 116,467.86       |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.5.1.2  | MR      | SITC of Wireless Microphone Receiver with Lavalieri Microphone - 30mw RF output, spec A-13                                     | 2   | No's |          | 45,349.70  |                  | 90,699.40        |
| 20.5.1.3  | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 2   | No's |          | 41,711.51  |                  | 83,423.01        |
| 20.5.1.4  | MR      | SITC of 4 Channel Automatix mixer , spec A-41  | 2   | No's |          | 65,793.16  |                  | 131,586.33       |
| 20.5.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.5.2.1  | MR      | SITC of 137" Diagonal Motorized projection sceern with minimum 200mm black drop and LVC, spec B-9                              | 2   | No's |          | 109,611.17 |                  | 219,222.35       |
| 20.5.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 2   | No's |          | 122,187.47 |                  | 244,374.94       |
| 20.5.2.3  | MR      | SITC of 4 X 1 HDMI Auto Switcher, spec B-16  | 2   | No's |          | 56,394.30  |                  | 112,788.61       |
| 20.5.2.4  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 2   | No's |          | 48,724.44  |                  | 97,448.88        |
| 20.5.2.5  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 6   | No's |          | 1,950.26   |                  | 11,701.53        |
| 20.5.2.6  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 2   | No's |          | 2,246.79   |                  | 4,493.57         |
| 20.5.2.7  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 2   | No's |          | 2,725.80   |                  | 5,451.59         |
| 20.5.2.8  | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40   | 2   | No's |          | 15,493.69  |                  | 30,987.39        |
| 20.5.2.9  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 2   | No's |          | 8,948.36   |                  | 17,896.73        |
| 20.5.2.11 | MR      | SITC of Conrol key pad with 2 Rs232, 6 monentray relay , ethernet monitor / control . Two I/o , spec B-45                      | 2   | No's |          | 71,902.82  |                  | 143,805.65       |
| 20.5.3    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.5.3.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1                              | 2   | No's |          | 2,819.32   |                  | 5,638.63         |
| 20.5.3.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 2   | No's |          | 4,700.00   |                  | 9,400.00         |
| 20.6      |         | <b>Audio Visual Systems of AV AIDS Room</b>  |     |      |          |            |                  |                  |
| 20.6.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.6.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1 | 6   | No's |          | 9,705.66   |                  | 58,233.93        |
| 20.6.1.2  | MR      | SITC of Wireless Microphone Receiver with Lavalieri Microphone - 30mw RF output, spec A-13                                     | 1   | No's |          | 45,349.70  |                  | 45,349.70        |
| 20.6.1.3  | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 1   | No's |          | 41,711.51  |                  | 41,711.51        |
| 20.6.1.4  | MR      | SITC of 4 Channel Automatix mixer , spec A-41  | 1   | No's |          | 65,793.16  |                  | 65,793.16        |
| 20.6.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.6.2.1  | MR      | SITC of 137" Diagonal Motorized projection sceern with minimum 200mm black drop and LVC, spec B-9                              | 1   | No's |          | 109,611.17 |                  | 109,611.17       |
| 20.6.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 1   | No's |          | 122,187.47 |                  | 122,187.47       |
| 20.6.2.3  | MR      | SITC of 4 X 1 HDMI Auto Switcher, spec B-16  | 1   | No's |          | 56,394.30  |                  | 56,394.30        |

| S. No     | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-----------|---------|---|-----|------|----------|--------------|------------------|------------------|
| 1         | 1A      | 2   | 3   | 4    | 5        | 6            | 7                | 8                |
| 20.6.2.4  | MR      | SITC of HDMI Audio De-embedder, spec B-30   | 1   | No's |          | 48,724.44    |                  | 48,724.44        |
| 20.6.2.5  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34   | 3   | No's |          | 1,950.26     |                  | 5,850.77         |
| 20.6.2.6  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35   | 1   | No's |          | 2,246.79     |                  | 2,246.79         |
| 20.6.2.7  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36  | 1   | No's |          | 2,725.80     |                  | 2,725.80         |
| 20.6.2.8  | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40  | 1   | No's |          | 15,493.69    |                  | 15,493.69        |
| 20.6.2.9  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41   | 1   | No's |          | 8,948.36     |                  | 8,948.36         |
| 20.6.2.11 | MR      | SITC of Conrol key pad with 2 Rs232, 6 monentray relay , ethernet monitor / control . Two I/o , spec B-45   | 1   | No's |          | 71,902.82    |                  | 71,902.82        |
| 20.6.3    |         | <b>Installation Equipment</b>   |     |      |          |              |                  |                  |
| 20.6.3.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1   | 1   | No's |          | 2,819.32     |                  | 2,819.32         |
| 20.6.3.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3   | 1   | No's |          | 4,700.00     |                  | 4,700.00         |
| 20.7      |         | <b>Audio Visual Systems of Auditorium</b>   |     |      |          |              |                  |                  |
| 20.7.1    |         | <b>Audio System</b>   |     |      |          |              |                  |                  |
| 20.7.1.1  | MR      | SITC of Box Type Speaker with drivers: 2 X 6.5" LF, 1 X HF, minimum 175W @ 8 Ohm with necessary mounting Accessories - Under balcony Speakers, spec A-5   | 4   | No's |          | 108,228.89   |                  | 432,915.55       |
| 20.7.1.2  | MR      | SITC of Biampified/Triampified 2/3 Way Dual 10" or better Line array module, with Individual Module Frequency Range of 60Hz - 16 kHz or better & Continuous Power Handling of >= minimum 450W LF + 125W MF-HF.The Loudspeaker shall have a Max. SPL (Peak) of >=126 dB or better for LF/MF-HF. It should have suitable Drivers for LF and MF/HF with Horizontal near dispersion pattern of 90° or better, Vertical dispersion of the array shall be 70 degrees or better (3 array modules or better); Suitable OEM hardware for suspending the array with a safety factor of 8:1 or better., spec A-6 | 2   | No's |          | 1,770,160.93 |                  | 3,540,321.85     |
| 20.7.1.3  | MR      | SITC of Dual 15-inch high-excursion or better woofers with frequency response (-10 dB) : 40 Hz - 280 Hz, The Sensitivity (SPL / 1 W @ 1 m) @ Array Position (free field) ≥ 97 dB SPL, Omni-directional below 100 Hz, The Maximum SPL @ 1 m Array Position (free field) ≥ 127 dB SPL, Long-Term Power Handling is minimum 1000 Watts @ 8 Ohms with Necessary mounting brackets, spec A-7   | 4   | No's |          | 464,295.27   |                  | 1,857,181.08     |
| 20.7.1.4  | MR      | SITC of Large Array Frame for suspension of up to 8 loudspeakers or Subwoofer, spec A-8   | 2   | No's |          | 270,329.29   |                  | 540,658.59       |
| 20.7.1.5  | MR      | SITC of Box Type Speaker drivers suitable for Stage Monitor : 2 X 8" LF, 1 X 1"HF or better frequency response of 80Hz to 16kHz, Nominal coverage pattern of minimum 90 degree X 60 degree with rotatable high frequency horn, Power handling of minimum 300W @ 8 Ohm, Sensitivity of 93 dB SPL, with appropriate delay and necessary mounting bracket, spec A-9  | 4   | No's |          | 122,002.71   |                  | 488,010.83       |

| S. No     | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2   | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.7.1.6  | MR      | SITC Of Box Type Speaker drivers: minimum 1X 5.25 " LF, 1 X 2"HF suitable or better for Stage Fill speakers with frequency response of 100Hz to 16kHz, Nominal coverage pattern of minimum 60 degree X 60 degrees, Power handling of minimum 100W @ 8 Ohm, Sensitivity of 88 dB SPL, with necessary mounting bracket, spec A-10 | 4   | No's |          | 55,097.56  |                  | 220,390.22       |
| 20.7.1.7  | MR      | SITC of Box type speaker with Minimum 40 Watts @ 6/8 ohms with necessary mounting Accessories, spec A-11  | 2   | No's |          | 36,281.59  |                  | 72,563.17        |
| 20.7.1.8  | MR      | SITC of 15.7" Condenser Gooseneck Microphone with Shock Mount, spec A-12  | 3   | No's |          | 42,925.00  |                  | 128,775.00       |
| 20.7.1.9  | MR      | SITC of Wireless Microphone Receiver with Lavalier Microphone - 30mw RF output, spec A-13   | 2   | No's |          | 44,409.93  |                  | 88,819.86        |
| 20.7.1.10 | MR      | SITC of UHF Wireless Handheld Microphone with Receiver - 30mw Power Output , spec A-14  | 4   | No's |          | 41,590.61  |                  | 166,362.45       |
| 20.7.1.11 | MR      | SITC of Antenna Splitter in the frequency range of 470 to 790 MHz and with two antenna inputs that are distributed to minimum four outputs, spec A-15   | 1   | No's |          | 69,082.37  |                  | 69,082.37        |
| 20.7.1.12 | MR      | SITC of Passive 2-way combiner 470 -1000 MHz 50 Ohm for wireless systems, spec A-16   | 2   | No's |          | 17,904.71  |                  | 35,809.42        |
| 20.7.1.13 | MR      | SITC Of Omni Directional Antenna UHF range between 470 to 790 MHz includes antenna amplifier, mounting kit & necessary Antenna cable, spec A-17   | 4   | No's |          | 69,632.09  |                  | 278,528.35       |
| 20.7.1.14 | MR      | SITC of 24 port Normalized / half normalized 1/4" Modular Microphone patch panel , spec A-18  | 1   | No's |          | 10,123.08  |                  | 10,123.08        |
| 20.7.1.15 | MR      | SITC of Customized Speaker Patch Panel, spec A-19   | 1   | No's |          | 11,278.40  |                  | 11,278.40        |
| 20.7.1.16 | MR      | SITC of Fixed / charsi based DSP with Full fledged DSP blocks over Cobranet / Dante, necessary logic ports & fire interface control Box, spec A-20  | 2   | No's |          | 452,186.58 |                  | 904,373.16       |
| 20.7.1.20 | MR      | SITC of 2 channel Mic / Line input card for above DSP / Additional DSP to full fill allthe above input and output requirements, spec A-21   | 4   | No's |          | 46,337.37  |                  | 185,349.50       |
| 20.7.1.18 | MR      | SITC of 2 channel Mic / Line output card for above DSP / Additional DSP to full fill allthe above input and output requirements, spec A-22  | 20  | No's |          | 13,741.88  |                  | 274,837.69       |
| 20.7.1.19 | MR      | SITC of 8 Channel Mic / Line audio Input Expander for above DSP / Additional DSP to full fill all the above input and output requirements with Dante/Cobranet support, spec A-23  | 1   | No's |          | 139,810.47 |                  | 139,810.47       |
| 20.7.1.20 | MR      | SITC of 8 Channel Mic / Line audio output Expander for above DSP / Additional DSP to full fill all the above input and output requirements with Dante/Cobranet support, spec A-24   | 1   | No's |          | 139,810.47 |                  | 139,810.47       |
| 20.7.1.21 | MR      | SITC of 5 Port network switch for Dante/cobranet connectivity, spec A-25  | 1   | No's |          | 846.25     |                  | 846.25           |
| 20.7.1.22 | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27   | 1   | No's |          | 41,711.51  |                  | 41,711.51        |
| 20.7.1.23 | MR      | SITC of 4 Channel amplifier 240 /250W @70.7 Volts, spec A-28  | 1   | No's |          | 101,748.57 |                  | 101,748.57       |
| 20.7.1.24 | MR      | SITC of 8 Channel amplifier with 500-800W @ 4/2Ω, 1000-1200W@ 4/8 Ω, spec A-30  | 5   | No's |          | 448,297.48 |                  | 2,241,487.38     |
| 20.7.1.25 | MR      | SITC of 4 Channel amplifier with 250-300 W @ 8 Ω, spec A-31   | 1   | No's |          | 415,168.23 |                  | 415,168.23       |

| S. No     | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-----------|---------|---|-----|------|----------|--------------|------------------|------------------|
| 1         | 1A      | 2   | 3   | 4    | 5        | 6            | 7                | 8                |
| 20.7.1.26 | MR      | SITC of 32 Channel Digital Audio Mixing Console with builtin / external MADI Card, Ethernet Version for the above Mixing console, spec A-32                           | 1   | No's |          | 465,706.07   |                  | 465,706.07       |
| 20.7.1.27 | MR      | SITC of 32 Channel Stage box (Madi - Cat5), spec A-33   | 1   | No's |          | 215,429.05   |                  | 215,429.05       |
| 20.7.1.28 | MR      | SITC of Vocal Wired Microphone - Cardioid, spec A-34  | 6   | No's |          | 4,680.61     |                  | 28,083.67        |
| 20.7.1.29 | MR      | SITC of Microphone Boom Stand, spec A-35  | 4   | No's |          | 7,989.20     |                  | 31,956.81        |
| 20.7.1.30 | MR      | SITC of Microphone Table Stand, spec A-36   | 4   | No's |          | 7,049.43     |                  | 28,197.72        |
| 20.7.1.31 | MR      | SITC of Molded Cable with XLR Connector - Minimum 4.6Mtr, spec A-37   | 4   | No's |          | 939.77       |                  | 3,759.09         |
| 20.7.1.32 | MR      | SITC of Molded Cable with XLR Connector - Minimum 7 Mtr, spec A-38  | 4   | No's |          | 1,409.66     |                  | 5,638.63         |
| 20.7.1.33 | MR      | SITC of Molded Cable with XLR Connector - 10 Mtr, spec A-39   | 6   | No's |          | 1,879.54     |                  | 11,277.26        |
| 20.7.2    |         | <b>Video System</b>   |     |      |          |              |                  |                  |
| 20.7.2.1  | MR      | SITC of 32" LED LCD Display with minimum 2 HDMI, VGA, VGAA, USB and RS232 Connectivity and Built in Speakers, spec B-1  | 1   | No's |          | 28,196.58    |                  | 28,196.58        |
| 20.7.2.2  | MR      | SITC of 48 / 49" Full HD LED LCD Display with minimum 2 HDMI, VGA, VGAA, USB and RS232 Connectivity and Built in Speakers, spec B-2                                   | 1   | No's |          | 61,093.16    |                  | 61,093.16        |
| 20.7.2.3  | MR      | SITC of Flat Screen Wall Mount with Tilt to support up to 42" (107cm) / Minimum 25kg (55lbs), spec B-5  | 1   | No's |          | 4,887.04     |                  | 4,887.04         |
| 20.7.2.4  | MR      | SITC of Low Level Flat Screen Trolley with Adjustable tilt & fixed positions of 0°, -22.5°, -45°, -67.5° and -90° up to 65" (165cm) / minimum 70kg (154lbs), spec B-6 | 1   | No's |          | 67,672.71    |                  | 67,672.71        |
| 20.7.2.5  | MR      | SITC of 392" Diagonal Motorized projection Tensioned screen with 1000 mm black drop and LVC with necessary motorized winch, spec B-11                                 | 1   | No's |          | 1,523,690.89 |                  | 1,523,690.89     |
| 20.7.2.6  | MR      | SITC of 13000- 14000ANSI Lumens WUXGA Laser Projector with HDMI, VGA and RS232 control with suitable zoom lens, spec B-14   | 1   | No's |          | 1,926,796.06 |                  | 1,926,796.06     |
| 20.7.2.7  | MR      | SITC Of 16 x16 Matrix switcher Charis with Serial Control Gateway and necessary mounting accessories, spec B-18   | 1   | No's |          | 649,659.59   |                  | 649,659.59       |
| 20.7.2.8  | MR      | SITC of Minimum 2 Input HDBaseT input card with required Qty sufficient to accommodate No. of HDBaseT inputs, spec B-19   | 3   | No's |          | 112,862.74   |                  | 338,588.22       |
| 20.7.2.9  | MR      | SITC of 2 Input HDMI input card with required Qty sufficient to accommodate No. of HDMI inputs, spec B-20   | 3   | No's |          | 81,207.02    |                  | 243,621.06       |
| 20.7.2.10 | MR      | SITC of 2 output HDBaseT output card with required Qty sufficient to accommodate No. of HDBaseT outputs, spec B-21  | 2   | No's |          | 112,862.74   |                  | 225,725.48       |
| 20.7.2.11 | MR      | SITC of 2 Output HDMI output card with Analog Audio out with required Qty sufficient to accommodate No. of HDMI outputs, spec B-22                                    | 2   | No's |          | 54,138.39    |                  | 108,276.79       |
| 20.7.2.12 | MR      | SITC of Box Transmitter with 1 HDMI & RS232 with cat out output with necessary mounting bracket support up to 180mtr, spec B-23                                       | 1   | No's |          | 32,482.58    |                  | 32,482.58        |
| 20.7.2.13 | MR      | SITC of Wallplate type Transmitter with 1 HDMI & cat out output with necessary mounting bracket support up to 180mtr, spec B-24                                       | 5   | No's |          | 30,603.04    |                  | 153,015.18       |
| 20.7.2.14 | MR      | SITC of Wallplate type Receiver with 1 HDMI & RS232 with cat output with necessary mounting bracket support up to 180mtr, spec B-25                                   | 2   | No's |          | 32,482.58    |                  | 64,965.16        |

| S. No     | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2   | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.7.2.15 | MR      | SITC of Box type Receiver with 1 HDMI & RS232 with cat out output with necessary mounting bracket support up to 180mtr, spec B-26   | 2   | No's |          | 32,482.58  |                  | 64,965.16        |
| 20.7.2.16 | MR      | SITC of Wirless Presentation Box, spec B-31   | 1   | No's |          | 62,785.67  |                  | 62,785.67        |
| 20.7.2.20 | MR      | SITC of PTZ Camera with HDMI and RS232 Connectivity, spec B-33  | 1   | No's |          | 334,604.45 |                  | 334,604.45       |
| 20.7.2.18 | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34   | 8   | No's |          | 1,950.26   |                  | 15,602.04        |
| 20.7.2.19 | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35   | 3   | No's |          | 2,246.79   |                  | 6,740.36         |
| 20.7.2.20 | MR      | SITC of 10.7mtr Standard HDMI (M) to HDMI (M) Cable, spec B-39  | 2   | No's |          | 7,209.10   |                  | 14,418.20        |
| 20.7.3    |         | <b>Control System</b>   |     |      |          |            |                  |                  |
| 20.7.3.1  | MR      | SITC of 7" wired Touch panel with Table top docking station , spec C-1  | 1   | No's |          | 112,788.61 |                  | 112,788.61       |
| 20.7.3.2  | MR      | SITC of 10" wired touch panel with Table top docking station , spec C-2   | 1   | No's |          | 219,259.98 |                  | 219,259.98       |
| 20.7.3.3  | MR      | SITC of Integrated Control Processor with minimum 6 RS232, 8 I/R/Serial Ports, 8 I/O, 8 Versi Isolated Relays, 10/100 Ethernet Port & with BACNET Support, spec C-4   | 1   | No's |          | 363,928.99 |                  | 363,928.99       |
| 20.7.3.4  | MR      | SITC of IR Probe, spec C-5  | 1   | No's |          | 4,210.73   |                  | 4,210.73         |
| 20.7.3.5  | MR      | SITC of POE Injector, spec C-6  | 2   | No's |          | 8,270.91   |                  | 16,541.81        |
| 20.7.4    |         | <b>Installation Equipment</b>   |     |      |          |            |                  |                  |
| 20.7.4.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1   | 6   | No's |          | 2,819.32   |                  | 16,915.90        |
| 20.7.4.2  | MR      | SITC of 6.25" Deep floor box + Plates, spec E-2   | 3   | No's |          | 14,098.86  |                  | 42,296.58        |
| 20.7.4.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3   | 1   | No's |          | 4,700.00   |                  | 4,700.00         |
| 20.7.4.4  | MR      | SITC of 42 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required , spec E-6   | 2   | No's |          | 46,995.44  |                  | 93,990.89        |
| 20.8      |         | <b>Audio Visual Systems of Board Room</b>   |     |      |          |            |                  |                  |
| 20.8.1    |         | <b>Audio System</b>   |     |      |          |            |                  |                  |
| 20.8.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1  | 2   | No's |          | 9,705.66   |                  | 19,411.31        |
| 20.8.1.2  | MR      | SITC of Condenser Cardioid Boundary Microphone capsule with necessary mounting Accessories along with LED Ring with indicators & Push button for microphones , spec A-2   | 9   | No's |          | 27,163.29  |                  | 244,469.60       |
| 20.8.1.3  | MR      | SITC of Audio DSP with minimum 12 Mic/Line In, 8 Out should be able interconnected via AVB / Dante, with VOIP interface, necessary expanders/required no. of additional DSP's and accessories with sufficient Logic I/O ports/Box compatible with the DSP, spec A-3 | 1   | No's |          | 349,126.44 |                  | 349,126.44       |
| 20.8.1.4  | MR      | SITC of 2 Channel Amplifier with minimum 15-25 Watts per Channel @ 8/4 Ohms, spec A-26  | 1   | No's |          | 24,813.86  |                  | 24,813.86        |
| 20.8.2    |         | <b>Video System</b>   |     |      |          |            |                  |                  |
| 20.8.2.1  | MR      | SITC of 94" Diagonal Motorized projection sceern with minimum 100 to 400mm black drop and LVC, spec B-7   | 1   | No's |          | 97,467.13  |                  | 97,467.13        |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.8.2.2  | MR      | SITC of 3500 -4000 ANSI Lumens WUXGA/WXGA Laser Projector with HDMI, VGA and RS232 control with standard lens, spec B-12   | 1   | No's |          | 263,172.66 |                  | 263,172.66       |
| 20.8.2.3  | MR      | SITC of Minimum 8x4 HDMI Matrix switcher with RS232 , Ethernet & IR with necessary Extenders / Converters and mounting accessories, spec B-15                        | 1   | No's |          | 297,760.60 |                  | 297,760.60       |
| 20.8.2.4  | MR      | SITC of VGA to HDMI Scaler, spec B-29  | 1   | No's |          | 27,068.63  |                  | 27,068.63        |
| 20.8.2.5  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 1   | No's |          | 48,724.44  |                  | 48,724.44        |
| 20.8.2.6  | MR      | SITC of Wirless Presentation Box, spec B-31  | 1   | No's |          | 62,785.67  |                  | 62,785.67        |
| 20.8.2.7  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 10  | No's |          | 1,950.26   |                  | 19,502.55        |
| 20.8.2.8  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 3   | No's |          | 2,246.79   |                  | 6,740.36         |
| 20.8.2.9  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 2   | No's |          | 2,725.80   |                  | 5,451.59         |
| 20.8.2.10 | MR      | SITC of 4.6mtr Standard HDMI (M) to HDMI (M) Cable, spec B-37  | 1   | No's |          | 3,120.41   |                  | 3,120.41         |
| 20.8.2.11 | MR      | SITC of 7.6mtr Standard HDMI (M) to HDMI (M) Cable, spec B-38  | 2   | No's |          | 4,972.58   |                  | 9,945.16         |
| 20.8.2.12 | MR      | SITC of 10.7mtr Standard HDMI (M) to HDMI (M) Cable, spec B-39   | 2   | No's |          | 7,209.10   |                  | 14,418.20        |
| 20.8.2.13 | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-40   | 1   | No's |          | 15,493.69  |                  | 15,493.69        |
| 20.8.2.14 | MR      | SITC of Blu-ray Player, spec B-42  | 1   | No's |          | 7,040.31   |                  | 7,040.31         |
| 20.8.2.15 | MR      | SITC of HD Set Top Box, spec B-43  | 1   | No's |          |            |                  | -                |
| 20.8.3    |         | <b>Control System</b>  |     |      |          |            |                  |                  |
| 20.8.3.1  | MR      | SITC of 10" wired touch panel with Table top docking station , spec C-2  | 1   | No's |          | 219,259.98 |                  | 219,259.98       |
| 20.8.3.2  | MR      | SITC of Integrated Control Processor with minimu, 3 RS232, 8 I/R/Serial Ports, 8 Isolated Relays, 2 digital In, 10/100 Ethernet Port & with BACNET Support, spec C-3 | 1   | No's |          | 148,879.73 |                  | 148,879.73       |
| 20.8.3.3  | MR      | SITC of POE Injector, spec C-6   | 1   | No's |          | 8,270.91   |                  | 8,270.91         |
| 20.8.4    |         | <b>Video Conference System</b>   |     |      |          |            |                  |                  |
| 20.8.4.1  | MR      | SITC Of Codec with 12x HD Camera and Remote control,1HDMI,1 HDMI or DVI-I selectable inputs with 2HDMI outputs, spec D-1   | 1   | No's |          | 790,926.49 |                  | 790,926.49       |
| 20.8.4.2  | MR      | SITC of License with MultiSite Option , spec D-2   | 1   | No's |          | 263,642.54 |                  | 263,642.54       |
| 20.8.5    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.8.5.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1  | 3   | No's |          | 2,819.32   |                  | 8,457.95         |
| 20.8.5.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 1   | No's |          | 4,700.00   |                  | 4,700.00         |
| 20.8.5.3  | MR      | SITC of 12 U Closed Rack with Vent & Blank Panels, Shelves, Power distributor 12 No's -plus ID panel as required , spec E-4  | 2   | No's |          | 14,098.86  |                  | 28,197.72        |
| 20.9      |         | <b>Audio Visual Systems of Type 02 Typical Seminar Rooms - 2 No's</b>  |     |      |          |            |                  |                  |

| S. No     | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-----------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1         | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.9.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.9.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1 | 4   | No's |          | 9,705.66   |                  | 38,822.62        |
| 20.9.1.2  | MR      | SITC of Wireless Microphone Receiver with Lavalieri Microphone - 30mw RF output, spec A-13                                     | 2   | No's |          | 44,409.93  |                  | 88,819.86        |
| 20.9.1.3  | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 2   | No's |          | 41,711.51  |                  | 83,423.01        |
| 20.9.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.9.2.1  | MR      | SITC of 94" Diagonal Motorized projection sceern with minimum 100 to 400mm black drop and LVC, spec B-7                        | 2   | No's |          | 97,467.13  |                  | 194,934.26       |
| 20.9.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 2   | No's |          | 122,187.47 |                  | 244,374.94       |
| 20.9.2.3  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 2   | No's |          | 48,724.44  |                  | 97,448.88        |
| 20.9.2.4  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 6   | No's |          | 1,950.26   |                  | 11,701.53        |
| 20.9.2.5  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 4   | No's |          | 2,246.79   |                  | 8,987.14         |
| 20.9.2.6  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 2   | No's |          | 2,725.80   |                  | 5,451.59         |
| 20.9.2.7  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 2   | No's |          | 8,948.36   |                  | 17,896.73        |
| 20.9.2.9  | MR      | SITC of Conrol key pad with 2 Rs232, 6 monentray relay , ethernet monitor / control . Two I/o , spec B-45                      | 2   | No's |          | 71,902.82  |                  | 143,805.65       |
| 20.9.3    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.9.3.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1                              | 2   | No's |          | 2,819.32   |                  | 5,638.63         |
| 20.9.3.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 2   | No's |          | 4,700.00   |                  | 9,400.00         |
| 20.10     |         | <b>Audio Visual Systems of Type 01 Typical Seminar Rooms - 3 No's</b>  |     |      |          |            |                  |                  |
| 20.10.1   |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.10.1.1 | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1 | 12  | No's |          | 9,705.66   |                  | 116,467.86       |
| 20.10.1.2 | MR      | SITC of Wireless Microphone Receiver with Lavalieri Microphone - 30mw RF output, spec A-13                                     | 3   | No's |          | 44,409.93  |                  | 133,229.79       |
| 20.10.1.3 | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 3   | No's |          | 41,711.51  |                  | 125,134.52       |
| 20.10.2   |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.10.2.1 | MR      | SITC of 109" Diagonal Motorized projection sceern with minimum 400mm black drop and LVC, spec B-8                              | 3   | No's |          | 100,582.98 |                  | 301,748.93       |
| 20.10.2.2 | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 3   | No's |          | 122,187.47 |                  | 366,562.40       |
| 20.10.2.3 | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 3   | No's |          | 48,724.44  |                  | 146,173.32       |
| 20.10.2.4 | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 9   | No's |          | 1,950.26   |                  | 17,552.30        |



| S. No      | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|------------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1          | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.10.2.5  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 6   | No's |          | 2,246.79   |                  | 13,480.71        |
| 20.10.2.6  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 3   | No's |          | 2,725.80   |                  | 8,177.39         |
| 20.10.2.7  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 3   | No's |          | 8,948.36   |                  | 26,845.09        |
| 20.10.2.9  | MR      | SITC of Conrol key pad with 2 Rs232, 6 monentray relay , ethernet monitor / control . Two I/o , spec B-45                      | 3   | No's |          | 71,902.82  |                  | 215,708.47       |
| 20.10.3    |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.10.3.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1                              | 3   | No's |          | 2,819.32   |                  | 8,457.95         |
| 20.10.3.2  | MR      | SITC of eiling Mount kit for Projector , spec E-3  | 3   | No's |          | 4,700.00   |                  | 14,100.00        |
| 20.11      |         | <b>Audio Visual Systems of Type 03 Typical Seminar Rooms - 4 No's</b>  |     |      |          |            |                  |                  |
| 20.11.1    |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.11.1.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1 | 16  | No's |          | 9,705.66   |                  | 155,290.48       |
| 20.11.1.2  | MR      | SITC of Wireless Microphone Receiver with Lavalier Microphone - 30mw RF output, spec A-13                                      | 4   | No's |          | 44,409.93  |                  | 177,639.72       |
| 20.11.1.3  | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 4   | No's |          | 41,711.51  |                  | 166,846.03       |
| 20.11.1.4  | MR      | SITC of 4 Channel Automatix mixer , spec A-41  | 4   | No's |          | 65,793.16  |                  | 263,172.66       |
| 20.11.2    |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.11.2.1  | MR      | SITC of 94" Diagonal Motorized projection sceern with minimum 100 to 400mm black drop and LVC, spec B-8                        | 4   | No's |          | 97,467.13  |                  | 389,868.52       |
| 20.11.2.2  | MR      | SITC os 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 4   | No's |          | 122,187.47 |                  | 488,749.87       |
| 20.11.2.3  | MR      | SITC of 4 X 1 HDMI Auto Switcher, spec B-16  | 4   | No's |          | 56,394.30  |                  | 225,577.21       |
| 20.11.2.4  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 4   | No's |          | 48,724.44  |                  | 194,897.76       |
| 20.11.2.5  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 12  | No's |          | 1,950.26   |                  | 23,403.06        |
| 20.11.2.6  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 4   | No's |          | 2,246.79   |                  | 8,987.14         |
| 20.11.2.7  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 4   | No's |          | 2,725.80   |                  | 10,903.18        |
| 20.11.2.8  | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-39   | 4   | No's |          | 15,493.69  |                  | 61,974.77        |
| 20.11.2.9  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 4   | No's |          | 8,948.36   |                  | 35,793.45        |
| 20.11.2.10 | MR      | 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-43   | 4   | No's |          | 15,493.69  |                  | 61,974.77        |
| 20.11.2.11 | MR      | SITC of Conrol key pad with 2 Rs232, 6 monentray relay , ethernet monitor / control . Two I/o , spec B-45                      | 4   | No's |          | 71,902.82  |                  | 287,611.29       |

| S. No          | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|----------------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1              | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                |
| 20.11.3        |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.11.3<br>.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1                              | 4   | No's |          | 2,819.32   |                  | 11,277.26        |
| 20.11.3<br>.2  | MR      | SITC of ceiling Mount kit for Projector , spec E-3   | 4   | No's |          | 4,700.00   |                  | 18,800.00        |
| 20.12          |         | <b>Audio Visual Systems of Type 04 Typical Seminar Rooms - 2 No's</b>  |     |      |          |            |                  |                  |
| 20.12.1        |         | <b>Audio System</b>  |     |      |          |            |                  |                  |
| 20.12.1<br>.1  | MR      | SITC Of 2.25" to 4" Recessed Ceiling speaker with minimum 16 Watts @ 6/8/16 Ohms with necessary mounting Accessories, spec A-1 | 8   | No's |          | 9,705.66   |                  | 77,645.24        |
| 20.12.1<br>.2  | MR      | SITC of Wireless Microphone Receiver with Lavalier Microphone - 30mw RF output, spec A-13                                      | 2   | No's |          | 44,409.93  |                  | 88,819.86        |
| 20.12.1<br>.3  | MR      | SITC of Two Channel Amplifier - 60 Watts Per Channel @ 8/4 Ohms integration with room key pad control , spec A-27              | 2   | No's |          | 41,711.51  |                  | 83,423.01        |
| 20.12.1<br>.4  | MR      | SITC of 4 Channel Automatix mixer , spec A-41  | 2   | No's |          | 65,793.16  |                  | 131,586.33       |
| 20.12.2        |         | <b>Video System</b>  |     |      |          |            |                  |                  |
| 20.12.2<br>.1  | MR      | SITC of 109" Diagonal Motorized projection screen with minimum 400mm black drop and LVC, spec B-9                              | 2   | No's |          | 100,582.98 |                  | 201,165.95       |
| 20.12.2<br>.2  | MR      | SITC of 5000 - 5400 ANSI Lumens 3 LCD WXGA lamp based Projector with HDMI, VGA and RS232 control with standard lens, spec B-13 | 2   | No's |          | 122,187.47 |                  | 244,374.94       |
| 20.12.2<br>.3  | MR      | SITC of 4 X 1 HDMI Auto Switcher, spec B-16  | 2   | No's |          | 56,394.30  |                  | 112,788.61       |
| 20.12.2<br>.4  | MR      | SITC of HDMI Audio De-embedder, spec B-30  | 2   | No's |          | 48,724.44  |                  | 97,448.88        |
| 20.12.2<br>.5  | MR      | SITC of 0.9mtr Standard HDMI (M) to HDMI (M) Cable, spec B-34  | 6   | No's |          | 1,950.26   |                  | 11,701.53        |
| 20.12.2<br>.6  | MR      | SITC of 1.8mtr Standard HDMI (M) to HDMI (M) Cable, spec B-35  | 2   | No's |          | 2,246.79   |                  | 4,493.57         |
| 20.12.2<br>.7  | MR      | SITC of 3 mtr Standard HDMI (M) to HDMI (M) Cable, spec B-36   | 2   | No's |          | 2,725.80   |                  | 5,451.59         |
| 20.12.2<br>.8  | MR      | SITC of 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-39   | 2   | No's |          | 15,493.69  |                  | 30,987.39        |
| 20.12.2<br>.9  | MR      | SITC of HDMI Cable equalizer up to 30 mtr , spec B-41  | 2   | No's |          | 8,948.36   |                  | 17,896.73        |
| 20.12.2<br>.10 | MR      | 15.2mtr Standard HDMI (M) to HDMI (M) Cable, spec B-43   | 2   | No's |          | 15,493.69  |                  | 30,987.39        |
| 20.12.2<br>.12 | MR      | SITC of Control key pad with 2 RS232, 6 momentary relay , ethernet monitor / control . Two I/O , spec B-45                     | 2   | No's |          | 71,902.82  |                  | 143,805.65       |
| 20.12.3        |         | <b>Installation Equipment</b>  |     |      |          |            |                  |                  |
| 20.12.3<br>.1  | MR      | SITC of Wall Plates / Table Plate / VC Plate / Credenza Plate with necessary back boxes, spec E-1                              | 2   | No's |          | 2,819.32   |                  | 5,638.63         |
| 20.12.3<br>.2  | MR      | SITC of ceiling Mount kit for Projector , spec E-3   | 2   | No's |          | 4,700.00   |                  | 9,400.00         |
| 20.13          |         | <b>Audio Visual Systems of Portable Pool</b>   |     |      |          |            |                  |                  |

| S. No         | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items     |
|---------------|---------|--|-----|------|----------|------------|------------------|----------------------|
| 1             | 1A      | 2  | 3   | 4    | 5        | 6          | 7                | 8                    |
| 20.13.1       |         | <b>Audio System</b>  |     |      |          |            |                  |                      |
| 20.13.1<br>.1 | MR      | SITC of Portable audio system consists of powered 8" powered speakers ( pair ) with 8 channel mixer and one wired microphone , spec A-42 | 1   | No's |          | 234,974.93 |                  | 234,974.93           |
| 20.13.2       |         | <b>Video System</b>  |     |      |          |            |                  |                      |
| 20.13.2<br>.1 | MR      | VGA to HDMI Scaler, spec B-32  | 1   | No's |          | 27,068.63  |                  | 27,068.63            |
| 20.13.2<br>.2 | MR      | HD Desktop Visualizer with minimum 1 HDMI output, should be controlled manually and via In room control system, spec B-35                | 2   | No's |          | 307,582.59 |                  | 615,165.17           |
| 20.13.2<br>.3 | MR      | AV Over IP Streaming Encoder with minimum 1 HDMI input and LAN connectivity, spec B-46   | 1   | No's |          | 81,207.02  |                  | 81,207.02            |
| 20.13.2<br>.4 | MR      | AV Over IP Streaming Decoder with minimum 1 HDMI output and LAN connectivity, spec B-47  | 1   | No's |          | 81,203.60  |                  | 81,203.60            |
| 20.14         | MR      | SITC of Required Cables, Connectors and other accessories to complete the Installation, spec F-1   | 1   | Lot  |          | 672,413.71 |                  | 672,413.71           |
|               |         | <b>Sub-total (AUDIO VISUAL SYSTEM)</b>   |     |      |          |            |                  | <b>45,500,000.00</b> |

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at GUNTUR – ANDHRA PRADESH.**

**MAIN ABSTRACT SHEET**

| <b>A</b>     | <b>HVAC WORKS</b>  |                    |                    |
|--------------|--|--------------------|--------------------|
| <b>S. No</b> | <b>SUB - HEADS</b>                                       | <b>DSR AMOUNT</b>  | <b>NSR AMOUNT</b>  |
| 1.0          | MACHINERY  | -                  | 260,966,796        |
| 2.0          | PLUMBING   | 40,038,527         | 60,715,367         |
| 3.0          | DUCTING, GRILLS, DIFFUSER AND INSULATION (CFC/HCFC-FREE) | 177,668,752        | 65,808,673         |
| 4.0          | ELECTRICAL WORKS   | 3,044,687          | 42,929,546         |
|              | <b>TOTAL</b>   | <b>220,751,966</b> | <b>430,420,382</b> |
|              | <b>NET TOTAL</b>   | <b>651,172,348</b> |                    |

**ABSTRACT OF COST FOR HVAC WORKS**

**Name of Work : Construction of Hospital & Academic Campus at All India Institute of Medical Sciences Campus (AIIMS) at GUNTUR – ANDHRA PRADESH.**

| S No.               | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|---------------------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1                   | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
| <b>SUB HEAD 'A'</b> |         | <b>MACHINERY</b>   |     |      |          |          |                  |                  |
| 1.0                 |         | WATER CHILLING UNITS FOR IPD & ACADEMIC  |     |      |          |          |                  |                  |
| 1.1                 |         | Supply, Installation, Testing and Commissioning of water cooled centrifugal type Water chiller machines ( ARI Certified ) each having a capacity of 1000 TR (actual) at chilled water inlet/outlet temperature of 54°F /44°F with chilled water circulation rate of 2400 USGPM and condenser water inlet/outlet temprature of 88°F /98°F with circulation rate of 3000 USGPM , suitable for operation on refrigerant R134a each comprising of the following complete as per specification and as required. |     |      |          |          |                  |                  |
|                     |         | a. 1 No.- centrifugal type compressor hermatic / semi hermatic / open, single/multistage type, automatic capacity control, safety switches, speed increasing gears, forced feed lubrication system etc. as per specifications. The compressor shall have mechanism for stable operation at part loads .  |     |      |          |          |                  |                  |
|                     |         | b. 1 No.- Suitable capacity squirrel cage induction motor ( as per design of chiller manufacturer) suitable for operation on 415±10% volts, 50 Hz A.C. supply.   |     |      |          |          |                  |                  |
|                     |         | c. 1 No. factory fitted ( unit mounted or separate as per std design of Chiller manufacturer ) variable frequency drive with active harmonic filters to limit THDi to 5% at equipment level and suitable for compressor motor complete with ammeter with CTs, overload protection ,under voltage protection, protection against phase reversal & independent single phase preventers etc complete as required.   |     |      |          |          |                  |                  |
|                     |         | VFD shall be the same make and model which will be used for the testing at manufacturer's works for the AHRI certification. The power and control wiring of the VFD starter to chiller shall be done by the manufacturer.  |     |      |          |          |                  |                  |
|                     |         | Necessary drive arrangement.   |     |      |          |          |                  |                  |
|                     |         | d. 1 Set- Lubrication Device consisting of automatic electric oil pump, oil cooler, head tank, oil strainer, automatic oil pressure regulating valve, oil heater, oil heater thermal switch etc. and related controls.   |     |      |          |          |                  |                  |
|                     |         | e. 1 No.- ASME stamped matching shell and tube water cooled condenser of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 8 m water head.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate      | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|---------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6             | 6                | 8                |
|       |         | f. 1 No.- ASME stamped matching shell and tube flooded type chiller of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 5 m water head.                               |     |      |          |               |                  |                  |
|       |         | g. 1 Lot- refrigerant piping fittings, valve and accessories to inter connect compressor, condenser, chiller and expansion valve.   |     |      |          |               |                  |                  |
|       |         | h. 1 Set- Advanced Microprocessor based control pannel with automatic controls, coloured & graphical display, complete with accessories as per specifications.  |     |      |          |               |                  |                  |
|       |         | i. Lot- Refrigerant line accessories comprising of safety valves, angle valve, liquid line indications, liquid level controls etc.  |     |      |          |               |                  |                  |
|       |         | j. Lot- water flow switches at inlet and outlet of condenser & chiller, water drain and air purge valves wherever required.   |     |      |          |               |                  |                  |
|       |         | k. Lot- Thermal insulation on machine as required.  |     |      |          |               |                  |                  |
|       |         | l. Lot- Victaulic coupling at the inlet and outlet piping connections of evaporator and condenser of chillers with vibration isolations.  |     |      |          |               |                  |                  |
|       |         | m. Lot- Frame work for mounting the above condenser, chiller, compressor and motor with base plate complete with anti vibration pads/springs.   |     |      |          |               |                  |                  |
|       |         | n. Lot-Initial/first charge of refrigerant gas and compressor oil.  |     |      |          |               |                  |                  |
|       |         | o. Necessary spring isolators with 25 mm deflection from OEM for the chilling unit.   |     |      |          |               |                  |                  |
|       |         | p. Microprocessor based control panel complete with accessories as per specifications and BMS compatible BACNET/MODBUS Protocol with BMS cards.   |     |      |          |               |                  |                  |
|       |         | q. Suitable RCC/Cement concrete foundation for the chilling units installation complete as required. As per the manufacturer drawing.   |     |      |          |               |                  |                  |
|       |         | r. The Minimum COP of 6.5 and IPLV $\geq$ 9.25 at ARI conditions should be complied . NPLV less than 0.37.  |     |      |          |               |                  |                  |
|       |         | s. The IKW/TR should not be more than 0.64 (inclusive of all losses) at duty conditions.  |     |      |          |               |                  |                  |
|       |         | t. One randomly selected chiller shall be tested as per conditions stipulated in tender for points 25%, 50%, 75% and 100% and test report shall be submitted.   |     |      |          |               |                  |                  |
|       |         | u. Automatic tube cleaning system designed for automatic continuous cleaning of heat exchangers with injector,ball trap,drain valves,injection valves, manual ball valves, check valve,drain valve etc. |     |      |          |               |                  |                  |
|       |         | Chiller Fouling Factor : 0.0005 (FPS Unit)  |     |      |          |               |                  |                  |
|       |         | Condenser Fouling Factor : 0.001 (FPS Unit)   |     |      |          |               |                  |                  |
|       |         | Complete water chilling machine as above.(4W+1S)  | 5   | Nos. |          | 16,656,400.00 | -                | 83,282,000.00    |
| 1.2   |         | WATER CHILLING UNITS FOR OT   |     |      |          |               |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
| 1.21  |         | Supply, Installation, Testing and Commissioning of water cooled centrifugal type Water chiller machines ( ARI Certified ) each having a capacity of 450 TR (actual) at chilled water inlet/outlet temperature of 52°F /42°F with chilled water circulation rate of 1080 USGPM and condenser water inlet/outlet temprature of 88°F /98°F with circulation rate of 1350 USGPM , suitable for operation on refrigerant R134a each comprising of the following complete as per specification and as required. |     |      |          |          |                  |                  |
|       |         | a. 1 No.- centrifugal type compressor hermetic / semi hermetic / open, single/multistage type, automatic capacity control, safety switches, speed increasing gears, forced feed lubrication system etc. as per specifications. The compressor shall have mechanism for stable operation at part loads .   |     |      |          |          |                  |                  |
|       |         | b. 1 No.- Suitable capacity squirrel cage induction motor ( as per design of chiller manufacturer) suitable for operation on 415±10% volts, 50 Hz A.C. supply.  |     |      |          |          |                  |                  |
|       |         | c. 1 No. factory fitted ( unit mounted or separate as per std design of Chiller manufacturer ) variable frequency drive with active harmonic filters to limit THDi to 5% at equipment level and suitable for compressor motor complete with ammeter with CTs, overload protection ,under voltage protection, protection against phase reversal & independent single phase preventers etc complete as required.  |     |      |          |          |                  |                  |
|       |         | VFD shall be the same make and model which will be used for the testing at manufacturer's works for the AHRI certification. The power and control wiring of the VFD starter to chiller shall be done by the manufacturer.   |     |      |          |          |                  |                  |
|       |         | Necessary drive arrangement.  |     |      |          |          |                  |                  |
|       |         | d. 1 Set- Lubrication Device consisting of automatic electric oil pump, oil cooler, head tank, oil strainer, automatic oil pressure regulating valve, oil heater, oil heater thermal switch etc. and related controls.  |     |      |          |          |                  |                  |
|       |         | e. 1 No.- ASME stamped matching shell and tube water cooled condenser of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 8 m water head.   |     |      |          |          |                  |                  |
|       |         | f. 1 No.- ASME stamped matching shell and tube flooded type chiller of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 5 m water head.   |     |      |          |          |                  |                  |
|       |         | g. 1 Lot- refrigerant piping fittings, valve and accessories to inter connect compressor, condenser, chiller and expansion valve.   |     |      |          |          |                  |                  |
|       |         | h. 1 Set- Advanced Microprocessor based control pannel with automatic controls, coloured & graphical display, complete with accessories as per specifications.  |     |      |          |          |                  |                  |
|       |         | i. Lot- Refrigerant line accessories comprising of safety valves, angle valve, liquid line indications, liquid level controls etc.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6            | 6                | 8                |
|       |         | j. Lot- water flow switches at inlet and outlet of condenser & chiller, water drain and air purge valves wherever required.   |     |      |          |              |                  |                  |
|       |         | k. Lot- Thermal insulation on machine as required.  |     |      |          |              |                  |                  |
|       |         | l. Lot- Victaulic coupling at the inlet and outlet piping connections of evaporator and condenser of chillers with vibration isolations.  |     |      |          |              |                  |                  |
|       |         | m. Lot- Frame work for mounting the above condenser, chiller, compressor and motor with base plate complete with anti vibration pads/springs.   |     |      |          |              |                  |                  |
|       |         | n. Lot-Initial/first charge of refrigerant gas and compressor oil.  |     |      |          |              |                  |                  |
|       |         | o. Necessary spring isolators with 25 mm deflection from OEM for the chilling unit.   |     |      |          |              |                  |                  |
|       |         | p. Microprocessor based control panel complete with accessories as per specifications and BMS compatible BACNET/MODBUS Protocol with BMS cards.   |     |      |          |              |                  |                  |
|       |         | q. Suitable RCC/Cement concrete foundation for the chilling units installation complete as required. As per the manufacturer drawing.   |     |      |          |              |                  |                  |
|       |         | r. The Minimum COP of 6.5 and IPLV $\geq$ 9.25 at ARI conditions should be complied . NPLV less than 0.37.  |     |      |          |              |                  |                  |
|       |         | s. The IKW/TR should not be more than 0.64 (inclusive of all losses) at duty conditions.  |     |      |          |              |                  |                  |
|       |         | t. One randomly selected chiller shall be tested as per conditions stipulated in tender for points 25%, 50%, 75% and 100%(No witness test) and test report shall be submitted.  |     |      |          |              |                  |                  |
|       |         | u. Automatic tube cleaning system designed for automatic continuous cleaning of heat exchangers with injector,ball trap,drain valves,injection valves, manual ball valves, check valve,drain valve etc.   |     |      |          |              |                  |                  |
|       |         | Chiller Fouling Factor : 0.0005 (FPS Unit)  |     |      |          |              |                  |                  |
|       |         | Condenser Fouling Factor : 0.001 (FPS Unit)   |     |      |          |              |                  |                  |
|       |         | Complete water chilling machine as above.(1W+1S)  | 2   | Nos. |          | 8,957,390.00 | -                | 17,914,780.00    |
| 1.3   |         | Plant Room Manager cum Optimiser  |     |      |          |              |                  |                  |
|       |         | Plant room manager shall be of same make as chiller.Plant Room Manager for sequencing, remote monitoring, controlling and report generation of all equipments in AC plant room/high side. Selected controller shall have capability to meet detailed IO summary mentioned under specifications. Supervisory controller for management level interface in MS Enclosure SWG thickness, powder coated Siemens grey for Supervisory Controller, IO Cards (with accessories like Transformer, MCBs, internal wiring and Relays with bases). Workstation PC i5 computer 3000 Mhz with 1 TB hard disk, 21" TFT monitor, 104 windows key board, mouse,serial and parallel ports with laser colour printer. This must have software integration on chillers with 3rd party interface available on BACNET including cabling & conduit work as required with card. |     |      |          |              |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6            | 6                | 8                |
| 1.3.1 |         | For Plant Room   |     |      |          |              |                  |                  |
|       |         | Chiller plant manager shall essentially be able to perform the following functions :   |     |      |          |              |                  |                  |
| i     |         | Chillers start and stop operation.   |     |      |          |              |                  |                  |
| ii    |         | Chillers auto sequencing.  |     |      |          |              |                  |                  |
| iii   |         | Optimizing chillers operation with optimization software and logic.  |     |      |          |              |                  |                  |
| iv    |         | Auto start and stop of condenser water pumps.  |     |      |          |              |                  |                  |
| v     |         | Auto start and stop of cooling towers.   |     |      |          |              |                  |                  |
| vi    |         | Auto start and stop of primary chilled water pumps.  |     |      |          |              |                  |                  |
| vii   |         | On and off operation of motorised butterfly valves at chiller outlet, at condenser outlet and at cooling tower inlet.  |     |      |          |              |                  |                  |
| viii  |         | Having capability for Software integration with secondary chilled water pumps panel.   |     |      |          |              |                  |                  |
| ix    |         | Having capability to interface with 3rd party BMS system over Bacnet / IP.   |     |      |          |              |                  |                  |
| x     |         | Having capability to monitor, operate and generate reports from remote location.   |     |      |          |              |                  |                  |
|       |         | Chiller plant manager shall be suitable to manage :  |     |      |          |              |                  |                  |
| i     |         | 7 Nos. Chillers  |     |      |          |              |                  |                  |
| ii    |         | 7 Nos. Condenser water pumps.  |     |      |          |              |                  |                  |
| iii   |         | 7 Nos. Primary chilled water pumps.  |     |      |          |              |                  |                  |
| iv    |         | 28 Nos. motorized Cooling towers Fans.   |     |      |          |              |                  |                  |
| v     |         | 7 Nos. Motorised Chilled water valves.   |     |      |          |              |                  |                  |
| vi    |         | 7 Nos. Motorised Condenser water valves.   |     |      |          |              |                  |                  |
| vii   |         | 7 Nos. Cooling tower valves.   |     |      |          |              |                  |                  |
|       |         | Chiller Plant Manager as described above   | 1   | Set  |          | 2,980,394.00 | -                | 2,980,394.00     |
|       |         | Note: it is to be ensured that if one more chiller set is added in plant room, plant managers must be capable of controlling that also.  |     |      |          |              |                  |                  |
| 2     |         | WATER CIRCULATION PUMPS  |     |      |          |              |                  |                  |
| 2.1   |         | Primary Chilled Water Pumps  |     |      |          |              |                  |                  |
|       |         | Supply, installation, testing and commissioning of split casing end suction type centrifugal chilled water pump sets factory assembled and tested for rated efficiency mounted on a common base frame etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments. |     |      |          |              |                  |                  |
|       |         | a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty.  |     |      |          |              |                  |                  |
|       |         | b. Channel base with vibration isolators, coupling, coupling guard etc.  |     |      |          |              |                  |                  |
|       |         | c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump.   |     |      |          |              |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | d. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/AC power supply.   |     |      |          |            |                  |                  |
|       |         | e. Suitable RCC/Cement concrete foundation for the pumps installation complete as required. As per the manufacturer drawing.   |     |      |          |            |                  |                  |
|       |         | The pump characteristic shall be as follows:   |     |      |          |            |                  |                  |
| 2.1.1 |         | Water flow rate=2400 USGPM   |     |      |          |            |                  |                  |
|       |         | Head = 15 Metre WC   |     |      |          |            |                  |                  |
|       |         | Primary chilled water pumps as described above. (4W+1S)  | 5   | Set  |          | 523,101.00 | -                | 2,615,505.00     |
| 2.1.2 |         | Water flow rate=1080 USGPM   |     |      |          |            |                  |                  |
|       |         | Head = 15 Metre WC   |     |      |          |            |                  |                  |
|       |         | Primary chilled water pumps as described above. (1W+1S)  | 2   | Set  |          | 230,102.00 | -                | 460,204.00       |
| 2.1.3 |         | Water flow rate=170 USGPM  |     |      |          |            |                  |                  |
|       |         | Head = 15 Metre WC   |     |      |          |            |                  |                  |
|       |         | Primary hot water pumps as described above. (2W+1S)  | 3   | Set  |          | 112,382.00 | -                | 337,146.00       |
| 2.2   |         | Secondary Pumps & Variable Speed Pumping System  |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing and commissioning of End suction, vertical split casing/ vertical inline type centrifugal chilled water recirculation pumps mounted on a common base etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments.  |     |      |          |            |                  |                  |
|       |         | The entire system along with the pumps must be sourced from single manufacturer/supplier only, for unit responsibility. The system shall be complete in all respects and suitable for the ratings for each zone/area as indicated.   |     |      |          |            |                  |                  |
|       |         | a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty.  |     |      |          |            |                  |                  |
|       |         | b. Channel base with vibration isolators, coupling, coupling guard etc.  |     |      |          |            |                  |                  |
|       |         | c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump.   |     |      |          |            |                  |                  |
|       |         | e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/AC power supply.   |     |      |          |            |                  |                  |
|       |         | f. 1 No. dedicated microprocessor based pump logic controller for each set of pumps with parallel pumping software duly down loaded and capable of controlling upto 5 pumps in parallel / accepting 2 analog input from zone sensor and should be capable of communicating with Building Management System by both hardware and software integration. The price shall include control software and networking hardware and software for integration and compatibility with BMS (BACNET Protocol) from the pump supplier. |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6            | 6                | 8                |
|       |         | g. All pumps to be provided with seperate VFD's (variable frequency drives). Separate control panel for each zone/set. Panel should also consist of cooling fan.   |     |      |          |              |                  |                  |
|       |         | h. Suitable no. electronic Differential Pressure Transmitters and separate PLC s for each sets..   |     |      |          |              |                  |                  |
|       |         | i. The cost will include making necessary flanged suction and delivery headers in C-Class MS   |     |      |          |              |                  |                  |
|       |         | j. Suitable RCC/Cement concrete foundation for the pumps installation complete as required, as per the manufacturer drawing.   |     |      |          |              |                  |                  |
|       |         | k. Complete set system to be mounted on a common MS base frame and shall follow following duty.  |     |      |          |              |                  |                  |
|       |         | The pump characteristic shall be as follows:   |     |      |          |              |                  |                  |
| 2.2.1 |         | Zone-1 IPD Building<br>2400 USGPM( For IPD Building)<br>Head = 35 Metre WC<br>Secondary chilled water pumps as described above. (3W+1S)  | 4   | Set  |          | 1,200,601.00 | -                | 4,802,404.00     |
| 2.2.2 |         | Zone-2 Academic Block<br>1200 USGPM ( For Academic blocks)<br>Head = 35 Metre WC<br>Secondary chilled water pumps as described above. (2W+1S)  | 3   | Set  |          | 712,015.00   | -                | 2,136,045.00     |
| 2.2.3 |         | 1080 USGPM ( for hospital OT)<br>Head = 30 Metre WC<br>Secondary chilled water pumps as described above. (1W+1S)   | 2   | Set  |          | 732,231.00   | -                | 1,464,462.00     |
| 2.2.4 |         | 170 USGPM ( for IPD block)<br>Head = 30 Metre WC<br>Hot water pumps as described above. (2W+1S)  | 3   | Set  |          | 218,453.00   | -                | 655,359.00       |
| 2.3   |         | Condenser water Pumps<br>Supply, installation, testing and commissioning of end suction back pull out type vertical split casing centrifugal pump sets factory assembled and tested for rated efficiency mounted on a common base frame etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments. |     |      |          |              |                  |                  |
|       |         | a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty.  |     |      |          |              |                  |                  |
|       |         | b. Channel base with vibration isolators, coupling, coupling guard etc.  |     |      |          |              |                  |                  |
|       |         | c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump.   |     |      |          |              |                  |                  |
|       |         | e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/AC power supply.   |     |      |          |              |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6            | 6                | 8                |
|       |         | f. Suitable RCC/Cement concrete foundation for the pumps installation complete as required. As per the manufacturer drawing.<br>The pump characteristic shall be as follows:  |     |      |          |              |                  |                  |
| 2.3.1 |         | Water flow rate=3000 USGPM<br>Head = 27 Metre WC<br>Condenser water pumps as described above. (4W+1S)   | 5   | Set  |          | 834,987.00   | -                | 4,174,935.00     |
| 2.3.2 |         | Water flow rate=1350 USGPM<br>Head = 27 Metre WC<br>Condenser water pumps as described above. (1W+1S)   | 2   | Set  |          | 380,218.00   | -                | 760,436.00       |
| 3.0   |         | COOLING TOWER (CTI Certified low noise model)<br>Supply, installation, testing and commissioning of induced draft FRP type cooling towers for air conditioning system. Each tower shall be complete with distribution system, filling, louvers, steel ladder, fan , motor , VFD and VFD controller for each fans. Motor shall be IP 55 suitable for outdoor installation, 415±10% volts, 50 Hz, 3 phase power supply, IE-3 and insulation calss F. Isolator enclosed in weather proof panel complete with earthing shall be included. Tower shall be selected on basis of water temperature 98 -88 degree F, ambient wet bulb 82 deg F. Cooling tower shall be compatible for working with BMS. Capacity shall be as follows:-<br>Suitable RCC/Cement concrete foundation for the Cooling tower installation complete as required. As per the manufacturer drawing. |     |      |          |              |                  |                  |
| 3.1   |         | Water flow rate=3000 usgpm (min 02 cells in each)<br>Cooling Tower as described above. (4W+1S)  | 5   | Set  |          | 2,313,251.00 | -                | 11,566,255.00    |
| 3.2   |         | Water flow rate=1350 usgpm (min 02 cells in each)<br>Cooling Tower as described above. (1W+1S)  | 2   | Set  |          | 1,019,482.00 | -                | 2,038,964.00     |
| 4.0   | NSR     | AIR COOLED SCROLL TYPE HEAT PUMP  |     |      |          |              |                  |                  |
| 4.1   |         | Supply, Installation, Testing and Commissioning of air cooled heat pumps complete with multiple hermetic scroll Compressors with independent refrigerant circuits, shell and tube type evaporator, expansion device, air cooled condenser with copper tubes and aluminium fins. The Motor suitable for 400 + 10% volts, 50 Hz, 3 Phase Power Supply, DOL Starter, Microprocessor Based Control Panel, Factory charged R410a Refrigerant and Oil, Suitable Capacity Control Mechanism.<br>Design Conditions:-<br>Hot water IN 110°F (43.3°C)<br>Hot water OUT 120°F (49.0°C)<br>Winter Ambient temp.:12.8°C<br>Chiller Fouling Factor 0.0005FPS  |     |      |          |              |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6            | 6                | 8                |
|       |         | Minimum COP : 3.0 as per ECBC  |     |      |          |              |                  |                  |
|       |         | Minimum Heating Capacity - 250 KW (2W+1S)  | 3   | Nos. |          | 2,280,660.00 | -                | 6,841,980.00     |
| 5     | NSR     | <b>AIR HANDLING UNIT'S (AHU) - OUTDOOR, FLOOR MOUNTED</b>  |     |      |          |              |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type, <b>THERMAL BREAK DESIGN</b> air handling unit (AHU) as per specifications & complete with the following: |     |      |          |              |                  |                  |
| a.    |         | Mixing box with return air & fresh air duct connection flanges .Fresh air port will have a motorised damper. Return air duct connection will have a fire retardant flexible connection and a motorised damper.                               |     |      |          |              |                  |                  |
| b     |         | Pre-filter section with MERV-7 filters. ( Synthetic Fibre Pre-filter)  |     |      |          |              |                  |                  |
| c     |         | Fine Filter section with MERV-14 filters.(99% down to 3 micron )   |     |      |          |              |                  |                  |
| d     |         | Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.  |     |      |          |              |                  |                  |
| e     |         | Fan section with Centrifugal fan AMCA certified high efficiency fan, Backward Curved, direct/belt driven with fire retardant flexible connection at fan outlet.  |     |      |          |              |                  |                  |
| f     |         | High efficiency 'IE3', continuous duty,IP55 squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive/direct drive package.    |     |      |          |              |                  |                  |
| g     |         | Fan & motor shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.  |     |      |          |              |                  |                  |
| h     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.   |     |      |          |              |                  |                  |
|       |         | The unit shall be BMS compatible.  |     |      |          |              |                  |                  |
|       |         | The AHU selection shall be :   |     |      |          |              |                  |                  |
|       |         | LEVEL-0  |     |      |          |              |                  |                  |
| 5.1   | NSR     | Space served : Laboratory Service  |     |      |          |              |                  |                  |
|       |         | Air Quantity : 9500 CFM (33.1 TR)  |     |      |          |              |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |              |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |              |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |              |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 322,050.00   | -                | 644,100.00       |
| 5.2   | NSR     | Space served : PAT + LAB   |     |      |          |              |                  |                  |
|       |         | Air Quantity : 9000 CFM (30.5 TR)  |     |      |          |              |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |              |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |              |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |              |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 313,459.00   | -                | 626,918.00       |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 5.3   | NSR     | Space served : Discharge Lounge & Café<br>Air Quantity : 4500 CFM (18.9TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 3.75 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above       | 2   | Nos. |          | 220,796.00 | -                | 441,592.00       |
| 5.4   | NSR     | Space served : Admin Station<br>Air Quantity : 8500 CFM (30.2 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                 | 2   | Nos. |          | 317,755.00 | -                | 635,510.00       |
| 5.5   | NSR     | Space served : IPD Lobby<br>Air Quantity : 6000 CFM (24.2TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                      | 2   | Nos. |          | 248,534.00 | -                | 497,068.00       |
| 5.6   | NSR     | Space served : Imaging Area,<br>Air Quantity : 16000 CFM (34.2 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                 | 5   | Nos. |          | 588,626.00 | -                | 2,943,130.00     |
| 5.7   | NSR     | Space served : Elevator 21 Side waiting Area<br>Air Quantity : 6000 CFM (23TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above    | 2   | Nos. |          | 248,534.00 | -                | 497,068.00       |
| 5.8   | NSR     | Space served : Elevator 01 Side waiting Area<br>Air Quantity : 7000 CFM (23.7 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above | 2   | Nos. |          | 296,399.00 | -                | 592,798.00       |
| 5.9   | NSR     | Space served : Taruma Beds<br>Air Quantity : 6300 CFM (28.2 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Cooling Coil Rows Deep : 6<br>AHU as described above   | 2   | Nos. |          | 272,098.00 | -                | 544,196.00       |
| 5.10  | NSR     | Space served : Waiting Area<br>Air Quantity : 7500 CFM (23.2TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above      | 1   | Nos. |          | 301,677.00 | -                | 301,677.00       |
| 5.11  | NSR     | Space served : Womens Imaging<br>Air Quantity : 7500 CFM (34.1 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above   | 2   | Nos. |          | 301,677.00 | -                | 603,354.00       |
| 5.12  | NSR     | Space served : MRI-1 & 2<br>Air Quantity : 4500 CFM (8.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above         | 2   | Nos. |          | 220,796.00 | -                | 441,592.00       |
| 5.13  | NSR     | LEVEL-01<br>Space served : café<br>Air Quantity : 11800 CFM (29.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above | 2   | Nos. |          | 392,008.00 | -                | 784,016.00       |
| 5.14  | NSR     | Space served : EVS<br>Air Quantity : 2600 CFM (8.3 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 2.2 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above               | 1   | Nos. |          | 147,893.00 | -                | 147,893.00       |
| 5.15  | NSR     | Space served : Morgue<br>Air Quantity : 7200 CFM (22.5 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above           | 1   | Nos. |          | 298,486.00 | -                | 298,486.00       |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 5.16  | NSR     | Space served : Linen Laundry<br>Air Quantity : 7500 CFM (27 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                       | 1   | Nos. |          | 301,677.00 | -                | 301,677.00       |
| 5.17  | NSR     | Space served : Class room<br>Air Quantity : 7000 CFM (20.3 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                        | 1   | Nos. |          | 296,399.00 | -                | 296,399.00       |
| 5.18  | NSR     | Space served : Endoscopy & Processor Waiting Area<br>Air Quantity : 11000 CFM (31.7TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above | 1   | Nos. |          | 385,258.00 | -                | 385,258.00       |
| 5.19  | NSR     | Space served : Bio Medical Shop<br>Air Quantity : 11500 CFM (33.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                  | 1   | Nos. |          | 386,853.00 | -                | 386,853.00       |
| 5.20  | NSR     | Space served : Elevator 27 Waiting Area<br>Air Quantity : 14500 CFM (23.5 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above          | 1   | Nos. |          | 502,345.00 | -                | 502,345.00       |
| 5.21  | NSR     | Space served : Packing Room<br>Air Quantity : 9500 CFM (32.7 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                      | 2   | Nos. |          | 322,050.00 | -                | 644,100.00       |
| 5.22  | NSR     | Space served : Corridor-1<br>Air Quantity : 6500 CFM (25.2 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 5.5 kW approx.  |     |      |          |            |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Cooling Coil Rows Deep : 6<br>AHU as described above   | 1   | Nos. |          | 282,162.00 | -                | 282,162.00       |
| 5.23  | NSR     | Space served : Corridor-2<br>Air Quantity : 11500 CFM (30.3TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above              | 2   | Nos. |          | 386,853.00 | -                | 773,706.00       |
| 5.24  | NSR     | LEVEL-02<br>Space served : Pharmacy<br>Air Quantity : 9500 CFM (36 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above     | 1   | Nos. |          | 322,050.00 | -                | 322,050.00       |
| 5.25  | NSR     | Space served : Material Management<br>Air Quantity : 8000 CFM (27.7 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above    | 2   | Nos. |          | 304,745.00 | -                | 609,490.00       |
| 5.26  | NSR     | Space served : IT Support<br>Air Quantity : 9400 CFM (27.9 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above             | 1   | Nos. |          | 320,332.00 | -                | 320,332.00       |
| 5.27  | NSR     | Space served : Office Upper<br>Air Quantity : 8000 CFM (26.2 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above           | 2   | Nos. |          | 304,745.00 | -                | 609,490.00       |
| 5.28  | NSR     | Space served : Associate Professor Area<br>Air Quantity : 8200 CFM (29 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above | 1   | Nos. |          | 312,600.00 | -                | 312,600.00       |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 5.29  | NSR     | Space served : HOD & Work Station<br>Air Quantity : 14000 CFM (42.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above          | 1   | Nos. |          | 493,753.00 | -                | 493,753.00       |
| 5.30  | NSR     | Space served : Meeting Room & Work Station<br>Air Quantity : 8000 CFM (24.7 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above | 2   | Nos. |          | 304,745.00 | -                | 609,490.00       |
| 5.31  | NSR     | Space served : Office Lower<br>Air Quantity : 10300 CFM (35.1 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                | 2   | Nos. |          | 384,644.00 | -                | 769,288.00       |
|       |         | LEVEL-03  |     |      |          |            |                  |                  |
| 5.32  | NSR     | Space served : Waiting Area Lower<br>Air Quantity : 11000 CFM (27.7 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above          | 1   | Nos. |          | 385,258.00 | -                | 385,258.00       |
| 5.33  | NSR     | Space served : Waiting Area Upper<br>Air Quantity : 10300 CFM (26.6TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above           | 1   | Nos. |          | 384,644.00 | -                | 384,644.00       |
| 5.34  | NSR     | Space served : C-section<br>Air Quantity : 3200 CFM (6.4 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 3.7 kW approx.<br>Cooling Coil Rows Deep : 6<br>AHU as described above                    | 2   | Nos. |          | 176,489.00 | -                | 352,978.00       |
|       |         | LEVEL-04  |     |      |          |            |                  |                  |
| 5.35  | NSR     | Space served : Waiting Area Lower<br>Air Quantity : 7500 CFM (22 TR)  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 301,677.00 | -                | 301,677.00       |
| 5.36  | NSR     | Space served : Waiting Area Upper  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7100 CFM (21.6 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 297,504.00 | -                | 297,504.00       |
|       |         | LEVEL-05   |     |      |          |            |                  |                  |
| 5.37  | NSR     | Space served : Waiting Area Lower  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 8500 CFM (24.9 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 317,755.00 | -                | 317,755.00       |
| 5.38  | NSR     | Space served : Waiting Area Upper  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 8000 CFM (23.9 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 304,745.00 | -                | 304,745.00       |
|       |         | LEVEL-06   |     |      |          |            |                  |                  |
| 5.39  | NSR     | Space served : Waiting Area Lower  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 9300 CFM (26.4 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 318,614.00 | -                | 318,614.00       |
| 5.40  | NSR     | Space served : Waiting Area Upper  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 8800 CFM (25.3 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          | 310,023.00 | -                | 310,023.00       |
|       |         | Necessary civil work such as foundation / base for AHU mounting is included in the scope of work.                        |     |      |          |            |                  |                  |
|       |         | All AHU's with mixing box with return air ducted, whether installed Indoor or outdoor shall be of thermal break design.* |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 6     | NSR     | AIR HANDLING UNIT'S (AHU) - OUTDOOR, FLOOR MOUNTED (FOR ACADEMIC BLOCK)  |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type, <b>THERMAL BREAK DESIGN</b> air handling unit (AHU) as per specifications & complete with the following: |     |      |          |            |                  |                  |
| a.    |         | Mixing box with return air & fresh air duct connection flanges .Fresh air port will have a motorised damper. Return air duct connection will have a fire retardant flexible connection and a motorised damper.                               |     |      |          |            |                  |                  |
| b     |         | Pre-filter section with MERV-7 filters. ( Synthetic Fibre Pre-filter)  |     |      |          |            |                  |                  |
| c     |         | Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.  |     |      |          |            |                  |                  |
| d     |         | Fan section with Centrifugal fan AMCA certified high efficiency fan, Backward Curved, direct/belt driven with fire retardant flexible connection at fan outlet.  |     |      |          |            |                  |                  |
| e     |         | High efficiency 'IE3' squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.                                       |     |      |          |            |                  |                  |
| f     |         | Fan & motor shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.  |     |      |          |            |                  |                  |
| g     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.   |     |      |          |            |                  |                  |
|       |         | The unit shall be BMS compatible.  |     |      |          |            |                  |                  |
|       |         | The AHU selection shall be :   |     |      |          |            |                  |                  |
|       |         | Auditorium   |     |      |          |            |                  |                  |
| 6.1   | NSR     | Space served : Terrace   |     |      |          |            |                  |                  |
|       |         | Air Quantity : 9000 CFM (15.1 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 215,518.00 | -                | 431,036.00       |
| Note: |         | Necessary civil work such as plinth / foundation / base for AHU mounting is excluded from scope of work.   |     |      |          |            |                  |                  |
|       |         | All AHU's with mixing box with return air ducted, whether installed Indoor or outdoor shall be of thermal break design.*   |     |      |          |            |                  |                  |
| 7     |         | AIR HANDLING UNIT'S (AHU) - INDOOR, FLOOR MOUNTED  |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type air handling unit (AHU) as per specifications & complete with the following:                              |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
| a     |         | Mixing box with return air & fresh air duct connection flanges .Fresh air port will have a motorised damper. Return air duct connection will have a fire retardant flexible connection and a motorised damper. |     |      |          |          |                  |                  |
| b     |         | Pre-filter section with MERV-7 filters. ( Synthetic Fibre Pre-filter)  |     |      |          |          |                  |                  |
| c     |         | Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.  |     |      |          |          |                  |                  |
| d     |         | Fan section with Centrifugal fan, AMCA certified high efficiency fan, Backward Curved (direct / belt driven) with fire retardant flexible connection at fan outlet.  |     |      |          |          |                  |                  |
| e     |         | High efficiency 'IE3 squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.          |     |      |          |          |                  |                  |
| f     |         | Fan & motor shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.  |     |      |          |          |                  |                  |
| g     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.   |     |      |          |          |                  |                  |
|       |         | The unit shall be BMS compatible.  |     |      |          |          |                  |                  |
|       |         | The AHU selection shall be :   |     |      |          |          |                  |                  |
| 7.1   |         | Space served : GF (Director Sec., Conf. RM, Student affair offices, Welcome centre, Director Finance, Director IT)   |     |      |          |          |                  |                  |
|       |         | Air Quantity : 8000 CFM (11.9 TR)  |     |      |          |          |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |          |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |          |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          |          | 211,346.00       | -                |
| 7.2   |         | Space served : First Floor-Conf. RM, Reading RM & Offices, Comp. Tech. RM, Director Offices  |     |      |          |          |                  |                  |
|       |         | Air Quantity : 6500 CFM (9.6 TR)   |     |      |          |          |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |          |                  |                  |
|       |         | Fan motor : 5.5kW approx.  |     |      |          |          |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          |          | 225,828.00       | -                |
| 7.3   |         | Space served : 2nd Floor-Reception, Director Colab   |     |      |          |          |                  |                  |
|       |         | Air Quantity : 5400 CFM (7.6 TR)   |     |      |          |          |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |          |                  |                  |
|       |         | Fan motor : 3.7kW approx.  |     |      |          |          |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          |          | 194,286.00       | -                |
| 7.4   |         | Space served : Ground Floor- Med. Lecture Theatre  |     |      |          |          |                  |                  |
|       |         | Air Quantity : 8200 CFM (17.2 TR)  |     |      |          |          |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |          |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |          |                  |                  |
|       |         | AHU as described above   | 1   | Nos. |          |          | 214,782.00       | -                |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 7.5   |         | Space served : Ground Floor- Conf. & Imaging RM<br>Air Quantity : 4500 CFM (8.4 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above         | 1   | Nos. |          | 169,126.00 | -                | 169,126.00       |
| 7.6   |         | Space served : First floor-Anatomy Lab<br>Air Quantity : 4000 CFM (6.9 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above                  | 1   | Nos. |          | 149,857.00 | -                | 149,857.00       |
| 7.7   |         | Space served : First floor-Demonstration Room<br>Air Quantity : 3500 CFM (7.7 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above           | 1   | Nos. |          | 140,283.00 | -                | 140,283.00       |
| 7.8   |         | Space served : 2nd floor- Forensic Lab<br>Air Quantity : 3500 CFM (6.3 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above                  | 1   | Nos. |          | 140,283.00 | -                | 140,283.00       |
| 7.9   |         | Space served : 2nd floor- Path Demonstration RM<br>Air Quantity : 4200 CFM (8.9 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above         | 1   | Nos. |          | 165,934.00 | -                | 165,934.00       |
| 8.10  |         | Space served : 3rd Floor- Microbiology Service Labs<br>Air Quantity : 4000 CFM (6.6 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above     | 1   | Nos. |          | 149,857.00 | -                | 149,857.00       |
| 8.11  |         | Space served : 3rd Floor- Microbiology Demonstration RM<br>Air Quantity : 3700 CFM (5.8 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above | 1   | Nos. |          | 146,788.00 | -                | 146,788.00       |
| 8.12  |         | Space served : 4th Floor- Pharmacy<br>Air Quantity : 2500 CFM (4.2 TR)<br>Total Static Pressure : 55 mm Wg  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Fan motor : 1.5 kW approx.<br>AHU as described above  | 1   | Nos. |          | 110,214.00 | -                | 110,214.00       |
| 8.13  |         | Space served : 4th Floor- Pharmacology Museum<br>Air Quantity : 3100 CFM (6.2 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above         | 1   | Nos. |          | 122,364.00 | -                | 122,364.00       |
| 8.14  |         | Space served : Ground Floor- Med. Lecture Theatre<br>Air Quantity : 8000 CFM (16.8 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 5.5 kW approx.<br>AHU as described above    | 1   | Nos. |          | 211,346.00 | -                | 211,346.00       |
| 8.15  |         | Space served : Ground Floor- Shared Lab Right<br>Air Quantity : 5500 CFM (9.8 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above         | 1   | Nos. |          | 195,390.00 | -                | 195,390.00       |
| 8.16  |         | Space served : 1st Floor- Lecture RM<br>Air Quantity : 6300 CFM (13.2 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 5.5 kW approx.<br>AHU as described above                 | 1   | Nos. |          | 204,104.00 | -                | 204,104.00       |
| 8.17  |         | Space served : 1st Floor- Lab Right<br>Air Quantity : 5200 CFM (10.3 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br><b>AHU as described above</b>           | 1   | Nos. |          | 187,044.00 | -                | 187,044.00       |
| 8.18  |         | Space served : 2nd Floor- Class RM<br>Air Quantity : 3500 CFM (6.1 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above                    | 1   | Nos. |          | 140,283.00 | -                | 140,283.00       |
| 8.19  |         | Space served : 2nd Floor- Lab Right & Comp. teaching<br>Air Quantity : 7500 CFM (10.7 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 5.5 kW approx.<br>AHU as described above | 1   | Nos. |          | 236,383.00 | -                | 236,383.00       |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 8.20  |         | Space served : GF - Conf. RM, Anatomy Demonstration RM<br>Air Quantity : 3500 CFM (7.1 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above   | 2   | Nos. |          | 140,283.00 | -                | 280,566.00       |
| 8.21  |         | Space served : FF - Offices & Waiting Area<br>Air Quantity : 4100 CFM (7.7 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above   | 2   | Nos. |          | 164,830.00 | -                | 329,660.00       |
| 8.22  |         | Space served : 2F - Offices & Waiting Area<br>Air Quantity : 3500 CFM (7 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above   | 2   | Nos. |          | 140,283.00 | -                | 280,566.00       |
| 8.23  |         | Space served : 3F - Bio Chem. Demonstration RM, Lower meeting room, Waiting Area & Upper offices<br>Air Quantity : 4100 CFM (7.5 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above | 2   | Nos. |          | 164,830.00 | -                | 329,660.00       |
| 8.24  |         | Space served : 4F - Offices<br>Air Quantity : 5000 CFM (9 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above  | 2   | Nos. |          | 174,280.00 | -                | 348,560.00       |
| 8.25  |         | Space served : GF - Examination Hall<br>Air Quantity : 7000 CFM (14.7 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above  | 1   | Nos. |          | 231,105.00 | -                | 231,105.00       |
| 8.26  |         | Space served : 2F - Corridors<br>Air Quantity : 4000 CFM (8.6 TR)<br>Total Static Pressure : 55 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above  | 1   | Nos. |          | 149,857.00 | -                | 149,857.00       |
| 8.27  |         | Space served : GF - Library, Conf. RM, waiting area<br>Air Quantity : 3000 CFM (6.3 TR)<br>Total Static Pressure : 55 mm Wg  |     |      |          |            |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Fan motor : 2.2 kW approx.   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 121,137.00 | -                | 242,274.00       |
| 8.28  |         | Space served : 1F - Faculty Lounge, Offices  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 3600 CFM (6.6 TR)   |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 2.2 kW approx.   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 145,684.00 | -                | 291,368.00       |
| 8.29  |         | Space served : 2F - Seminar & Learning area, Classroom   |     |      |          |            |                  |                  |
|       |         | Air Quantity : 4300 CFM (9.3 TR)   |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 55 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 3.7 kW approx.   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 166,916.00 | -                | 333,832.00       |
| Note: |         | Necessary civil work such as foundation / base for AHU mounting is included in the scope of work.  |     |      |          |            |                  |                  |
| 9     | NSR     | AIR HANDLING UNIT'S (AHU) - OUTDOOR, FLOOR MOUNTED   |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type, <b>THERMAL BREAK DESIGN</b> air handling unit (AHU) as per specifications & complete with the following: |     |      |          |            |                  |                  |
| a.    |         | Mixing box with return air & fresh air duct connection flanges .Fresh air port will have a motorised damper. Return air duct connection will have a fire retardant flexible connection and a motorised damper.                               |     |      |          |            |                  |                  |
| b     |         | Pre-filter section with MERV-7 filters. ( Synthetic Fibre Pre-filter)  |     |      |          |            |                  |                  |
| c     |         | Fine Filter section with MERV-14 filters.(99% down to 3 micron )   |     |      |          |            |                  |                  |
| d     |         | Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.  |     |      |          |            |                  |                  |
|       |         | Heating coil section with 2 Row deep copper tubes & aluminum fins heating coil.  |     |      |          |            |                  |                  |
| e     |         | Fan section with Centrifugal fan AMCA certified high efficiency fan, <b>Backward Curved direct driven system</b> , with fire retardant flexible connection at fan outlet.  |     |      |          |            |                  |                  |
| f     |         | High efficiency 'IE3', continuous duty,IP55 squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive/direct drive package.    |     |      |          |            |                  |                  |
| g     |         | Fan & motor shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.  |     |      |          |            |                  |                  |
| h     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.   |     |      |          |            |                  |                  |
|       |         | The unit shall be BMS compatible.  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                              | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | The AHU selection shall be :                  |     |      |          |            |                  |                  |
|       |         | LEVEL-0                                       |     |      |          |            |                  |                  |
| 9.1   | NSR     | Space served : Dialysis                       |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7500 CFM (27.2 TR)             |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg              |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.                    |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6                    |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2                    |     |      |          |            |                  |                  |
|       |         | AHU as described above                        | 2   | Nos. |          | 331,255.00 | -                | 662,510.00       |
| 9.2   | NSR     | Space served : Casulty Beds                   |     |      |          |            |                  |                  |
|       |         | Air Quantity : 6000 CFM (25.5 TR)             |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg              |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.                    |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6                    |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2                    |     |      |          |            |                  |                  |
|       |         | AHU as described above                        | 2   | Nos. |          | 272,712.00 | -                | 545,424.00       |
|       |         | LEVEL-1                                       |     |      |          |            |                  |                  |
| 9.3   | NSR     | Space served : ICU S.S                        |     |      |          |            |                  |                  |
|       |         | Air Quantity : 13500 CFM (41.4 TR)            |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg              |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.                     |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6                    |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2                    |     |      |          |            |                  |                  |
|       |         | AHU as described above                        | 2   | Nos. |          | 518,668.00 | -                | 1,037,336.00     |
| 9.4   | NSR     | Space served : Casualty Bed & Invasive Cardio |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7000 CFM (26.5 TR)             |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg              |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.                    |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6                    |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2                    |     |      |          |            |                  |                  |
|       |         | AHU as described above                        | 2   | Nos. |          | 324,382.00 | -                | 648,764.00       |
| 9.5   | NSR     | Space served : Casualty Bed with Medication   |     |      |          |            |                  |                  |
|       |         | Air Quantity : 5200 CFM (24.8 TR)             |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg              |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.                    |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6                    |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2                    |     |      |          |            |                  |                  |
|       |         | AHU as described above                        | 2   | Nos. |          | 261,666.00 | -                | 523,332.00       |
| 9.6   | NSR     | Space served : Casualty Bed lower             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 8200 CFM (28.3 TR)             |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|------------------------------------|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2                                  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.         |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 345,247.00 | -                | 690,494.00       |
| 9.7   | NSR     | Space served : ICU GEN             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 15300 CFM (41.7 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 567,025.00 | -                | 1,134,050.00     |
| 9.8   | NSR     | Space served : Aneasthesia         |     |      |          |            |                  |                  |
|       |         | Air Quantity : 6600 CFM (25.1 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.         |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 309,900.00 | -                | 619,800.00       |
| 9.9   | NSR     | LEVEL-03                           |     |      |          |            |                  |                  |
|       |         | Space served : S.S & Gen. Beds     |     |      |          |            |                  |                  |
|       |         | Air Quantity : 13200 CFM (37.4 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 3   | Nos. |          | 512,531.00 | -                | 1,537,593.00     |
| 9.10  | NSR     | Space served : NICU                |     |      |          |            |                  |                  |
|       |         | Air Quantity : 12200 CFM (36.2 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 448,710.00 | -                | 897,420.00       |
| 9.11  | NSR     | Space served : Birthing centre     |     |      |          |            |                  |                  |
|       |         | Air Quantity : 16000 CFM (40.5 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 629,618.00 | -                | 1,259,236.00     |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 9.12  | NSR     | Space served : SS & Gen. Beds<br>Air Quantity : 12400 CFM (36 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>Heating Coil Rows Deep : 2<br>AHU as described above   | 2   | Nos. |          | 452,761.00 | -                | 905,522.00       |
| 9.13  | NSR     | Space served : GYN & OB Beds<br>Air Quantity : 12000 CFM (35.4 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>Heating Coil Rows Deep : 2<br>AHU as described above  | 3   | Nos. |          | 433,369.00 | -                | 1,300,107.00     |
|       |         | LEVEL-04   |     |      |          |            |                  |                  |
| 9.14  | NSR     | Space served : Gen. Beds Lower<br>Air Quantity : 14000 CFM (47.2TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 11 kW approx.<br>Cooling Coil Rows Deep : 6<br>Heating Coil Rows Deep : 2<br>AHU as described above | 2   | Nos. |          | 546,283.00 | -                | 1,092,566.00     |
| 9.15  | NSR     | Space served : S.S Beds Lower<br>Air Quantity : 9100 CFM (30.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>Heating Coil Rows Deep : 2<br>AHU as described above | 2   | Nos. |          | 350,647.00 | -                | 701,294.00       |
| 9.16  | NSR     | Space served : Gen. Beds<br>Air Quantity : 9100 CFM (30.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.<br>Cooling Coil Rows Deep : 6<br>Heating Coil Rows Deep : 2<br>AHU as described above      | 2   | Nos. |          | 350,647.00 | -                | 701,294.00       |
| 9.17  | NSR     | Space served : S.S Beds Upper<br>Air Quantity : 9100 CFM (30.8 TR)<br>Total Static Pressure : 80 mm Wg<br>Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|------------------------------------|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2                                  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 350,647.00 | -                | 701,294.00       |
| 9.18  | NSR     | Space served : Gen. Beds Upper     |     |      |          |            |                  |                  |
|       |         | Air Quantity : 13400 CFM (46.3 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 516,704.00 | -                | 1,033,408.00     |
|       |         | LEVEL-05                           |     |      |          |            |                  |                  |
| 9.19  | NSR     | Space served : Gen. Beds Lower     |     |      |          |            |                  |                  |
|       |         | Air Quantity : 15500 CFM (48.3 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.          |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 571,075.00 | -                | 1,142,150.00     |
| 9.20  | NSR     | Space served : S.S Beds Lower      |     |      |          |            |                  |                  |
|       |         | Air Quantity : 9000 CFM (29.0 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.         |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 348,683.00 | -                | 697,366.00       |
| 9.21  | NSR     | Space served : ICU                 |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7900 CFM (23.3 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.         |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 336,778.00 | -                | 673,556.00       |
| 9.22  | NSR     | Space served : S.S Beds Upper      |     |      |          |            |                  |                  |
|       |         | Air Quantity : 9000 CFM (29.0 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.         |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6         |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2         |     |      |          |            |                  |                  |
|       |         | AHU as described above             | 2   | Nos. |          | 348,683.00 | -                | 697,366.00       |
| 9.23  | NSR     | Space served : Gen. Beds Upper     |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Air Quantity : 14700 CFM (46.9 TR)   |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 11 kW approx.  |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 549,965.00 | -                | 1,099,930.00     |
|       |         | LEVEL-06   |     |      |          |            |                  |                  |
| 9.24  | NSR     | Space served : S.S Beds Lower  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 10000 CFM (32.2 TR)   |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | <b>Heating Coil Rows Deep : 2</b>  |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 374,334.00 | -                | 748,668.00       |
| 9.25  | NSR     | Space served : ICU   |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7000 CFM (21.7 TR)  |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 324,382.00 | -                | 648,764.00       |
| 9.26  | NSR     | Space served : S.S Beds Upper  |     |      |          |            |                  |                  |
|       |         | Air Quantity : 10000 CFM (32.8 TR)   |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 80 mm Wg   |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|       |         | Cooling Coil Rows Deep : 6   |     |      |          |            |                  |                  |
|       |         | Heating Coil Rows Deep : 2   |     |      |          |            |                  |                  |
|       |         | AHU as described above   | 2   | Nos. |          | 374,334.00 | -                | 748,668.00       |
| Note: |         | Necessary civil work such as foundation / base for AHU mounting is included in the scope of work.  |     |      |          |            |                  |                  |
|       |         | All AHU's with mixing box with return air ducted, whether installed Indoor or outdoor shall be of thermal break design.*   |     |      |          |            |                  |                  |
| 10    |         | AIR HANDLING UNIT'S (AHU) - CEILING SUSPENDED  |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, CEILING SUSPENDED</b> , Sectionalized construction, draw through type air handling unit (AHU) as per specification & complete with the following: |     |      |          |            |                  |                  |
| a.    |         | Pre filter section with MERV-7 filters.  |     |      |          |            |                  |                  |
| b.    |         | Cooling coil section with <b>4 Row</b> deep copper tubes & aluminum fins cooling coil.   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| c.    |         | Fan section with DIDW Centrifugal fan, AMCA certified high efficiency fan, <b>Forward Curved</b> with fire retardant flexible connection at fan outlet.   |     |      |          |            |                  |                  |
| d.    |         | High efficiency 'IE3' squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.    |     |      |          |            |                  |                  |
| e.    |         | Supporting arrangement comprising of supporting GI rods, GI channels, dash fastners & vibration isolators.<br>The unit shall be BMS compatible.<br>The AHU selection shall be :                           |     |      |          |            |                  |                  |
| 10.1  |         | Space served : Ground Floor - OPD 1 to 6, Conference room , Register Bill<br>Air Quantity : 5200 CFM (9.1 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above | 1   | Nos. |          | 111,720.00 | -                | 111,720.00       |
| 10.2  |         | Space served : Ground Floor - Operation & Equipment room<br>Air Quantity : 2300 CFM ( 4 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.5 kW approx.<br>AHU as described above                   | 1   | Nos. |          | 65,645.00  | -                | 65,645.00        |
| 10.3  |         | Space served : Ground Floor - Medicine storage & Pharmacy<br>Air Quantity : 1100 CFM ( 1.9 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.1 kW approx.<br>AHU as described above                | 1   | Nos. |          | 51,525.00  | -                | 51,525.00        |
| 10.4  |         | Space served : Ground Floor - Manager & Admin<br>Air Quantity : 1200 CFM ( 2.0 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.1 kW approx.<br>AHU as described above                            | 1   | Nos. |          | 52,392.00  | -                | 52,392.00        |
| 10.5  |         | Space served : Ground Floor - Panchkarma<br>Air Quantity : 1700 CFM (3.1 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.1 kW approx.<br>AHU as described above                                  | 1   | Nos. |          | 50,906.00  | -                | 50,906.00        |
| 10.6  |         | Space served : Ground Floor - Yoga<br>Air Quantity : 1100 CFM (1.9 TR)<br>Total Static Pressure : 50 mm Wg  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|       |         | Fan motor : 1.1 kW approx.<br>AHU as described above   | 1   | Nos. |          | 50,906.00 | -                | 50,906.00        |
| 10.7  |         | Space served : Ground Floor - Meditation<br>Air Quantity : 1100 CFM (1.8 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.1 kW approx.<br>AHU as described above   | 1   | Nos. |          | 50,906.00 | -                | 50,906.00        |
| 10.8  |         | Space served : Ground Floor - Nurse station, Lobby & Nour<br>Air Quantity : 2600 CFM (4.9 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above  | 4   | Nos. |          | 68,865.00 | -                | 275,460.00       |
| 11    |         | AIR HANDLING UNIT'S (AHU) - CEILING SUSPENDED (FOR ACADEMIC BLOCK)<br>Supply, installation, testing & commissioning of <b>DOUBLE SKIN, CEILING SUSPENDED</b> , Sectionalized construction, draw through type air handling unit (AHU) as per specification & complete with the following: |     |      |          |           |                  |                  |
| a.    |         | Pre filter section with MERV-7 filters.  |     |      |          |           |                  |                  |
| b.    |         | Cooling coil section with <b>4 Row</b> deep copper tubes & aluminum fins cooling coil.   |     |      |          |           |                  |                  |
| c.    |         | Fan section with DIDW Centrifugal fan, AMCA certified high efficiency fan, <b>Forward Curved</b> with fire retardant flexible connection at fan outlet.  |     |      |          |           |                  |                  |
| d.    |         | High efficiency 'IE3' squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.   |     |      |          |           |                  |                  |
| e.    |         | Supporting arrangement comprising of supporting GI rods, GI channels, dash fasteners & vibration isolators.<br>The unit shall be BMS compatible.<br>The AHU selection shall be :   |     |      |          |           |                  |                  |
| 11.1  |         | Space served : Ground Floor - Café<br>Air Quantity : 4500 CFM (7.5 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above   | 2   | Nos. |          | 95,619.00 | -                | 191,238.00       |
| 11.2  |         | Space served : Ground Floor - Common area<br>Air Quantity : 2500 CFM (4.8 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.5 kW approx.  |     |      |          |           |                  |                  |



| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|       |         | AHU as described above  | 1   | Nos. |          | 67,503.00 | -                | 67,503.00        |
| 11.3  |         | Space served : First Floor-24x7 Reading room<br>Air Quantity : 4500 CFM (8.3 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 3.7 kW approx.          |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 3   | Nos. |          | 95,619.00 | -                | 286,857.00       |
| 11.4  |         | Space served : Second Floor-Offices<br>Air Quantity : 4000 CFM (6.4 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.                   |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 2   | Nos. |          | 85,710.00 | -                | 171,420.00       |
| 11.5  |         | Space served : Second Floor-Board Room<br>Air Quantity : 3200 CFM (5.4 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.                |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 1   | Nos. |          | 79,517.00 | -                | 79,517.00        |
| 11.6  |         | Space served : First Floor - Physiology Human Lab<br>Air Quantity : 3000 CFM (5.6 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.     |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 1   | Nos. |          | 76,421.00 | -                | 76,421.00        |
| 11.7  |         | Space served : First Floor - Physiology Amphibian Lab<br>Air Quantity : 3000 CFM (5.6 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx. |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 1   | Nos. |          | 76,421.00 | -                | 76,421.00        |
| 11.8  |         | Space served : First Floor - Physiology Clinical Lab<br>Air Quantity : 3200 CFM (5.5 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.  |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 1   | Nos. |          | 79,517.00 | -                | 79,517.00        |
| 11.9  |         | Space served : 2nd Floor - Clinical Pathology Lab<br>Air Quantity : 2800 CFM (5.2 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.5 kW approx.     |     |      |          |           |                  |                  |
|       |         | AHU as described above  | 1   | Nos. |          | 73,944.00 | -                | 73,944.00        |
| 11.10 |         | Space served : 2nd Floor - Pathology Lab for Morbid<br>Air Quantity : 2800 CFM (5.2 TR)   |     |      |          |           |                  |                  |

| S No. | Code No | Item Description                                     | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 1.5 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 1   | Nos. |          | 73,944.00 | -                | 73,944.00        |
| 11.11 |         | Space served : 2nd Floor - Medicine Museum           |     |      |          |           |                  |                  |
|       |         | Air Quantity : 1500 CFM (2.9 TR)                     |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 1.1 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 2   | Nos. |          | 52,144.00 | -                | 104,288.00       |
| 11.12 |         | Space served : 3rd Floor - Microbiology Tables       |     |      |          |           |                  |                  |
|       |         | Air Quantity : 3500 CFM (6 TR)                       |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 2.2 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 2   | Nos. |          | 82,614.00 | -                | 165,228.00       |
| 11.13 |         | Space served : 3rd Floor - Bio Chem Labs             |     |      |          |           |                  |                  |
|       |         | <b>Air Quantity : 3500 CFM (5.8 TR)</b>              |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 2.2 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 1   | Nos. |          | 82,614.00 | -                | 82,614.00        |
| 11.14 |         | Space served : 4th Floor - Pharmacology Experimental |     |      |          |           |                  |                  |
|       |         | Air Quantity : 3500 CFM (5.6 TR)                     |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 2.2 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 1   | Nos. |          | 82,614.00 | -                | 82,614.00        |
| 11.15 |         | Space served : 4th Floor - Practical Lab             |     |      |          |           |                  |                  |
|       |         | Air Quantity : 4000 CFM (6.3 TR)                     |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 2.2 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 1   | Nos. |          | 85,710.00 | -                | 85,710.00        |
| 11.16 |         | Space served : 4th Floor - Comm. Demonstration Room  |     |      |          |           |                  |                  |
|       |         | Air Quantity : 4500 CFM (4.7 TR)                     |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 3.7 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 2   | Nos. |          | 95,619.00 | -                | 191,238.00       |
| 11.17 |         | Space served : Ground Floor - Shared Lab Left        |     |      |          |           |                  |                  |
|       |         | Air Quantity : 2800 CFM (4.9 TR)                     |     |      |          |           |                  |                  |
|       |         | Total Static Pressure : 50 mm Wg                     |     |      |          |           |                  |                  |
|       |         | Fan motor : 2.2 kW approx.                           |     |      |          |           |                  |                  |
|       |         | AHU as described above                               | 2   | Nos. |          | 73,944.00 | -                | 147,888.00       |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 11.18 |         | Space served : 1st Floor - Lab Left<br>Air Quantity : 2500 CFM (5 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.5 kW approx.<br>AHU as described above                      | 2   | Nos. |          | 67,503.00  | -                | 135,006.00       |
| 11.19 |         | Space served : 2nd Floor - Lab Left<br>Air Quantity : 3500 CFM (6.5 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above                    | 2   | Nos. |          | 82,614.00  | -                | 165,228.00       |
| 11.20 |         | Space served : Ground Floor - Exam Hall Entrance Lobby<br>Air Quantity : 4600 CFM (8.6 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 3.7 kW approx.<br>AHU as described above | 2   | Nos. |          | 101,440.00 | -                | 202,880.00       |
| 11.21 |         | Space served : Ground Floor - Corridor<br>Air Quantity : 2000 CFM (4.3 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 1.1 kW approx.<br>AHU as described above                 | 2   | Nos. |          | 57,223.00  | -                | 114,446.00       |
| 11.22 |         | Space served : First Floor - Corridor<br>Air Quantity : 3500 CFM (7.5 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above                  | 2   | Nos. |          | 82,614.00  | -                | 165,228.00       |
| 11.23 |         | Space served : 3rd Floor - Sound & Light Room<br>Air Quantity : 4000 CFM (7.7 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above          | 2   | Nos. |          | 85,710.00  | -                | 171,420.00       |
| 11.24 |         | Space served : 4th Floor - Corridor<br>Air Quantity : 3000 CFM (6 TR)<br>Total Static Pressure : 50 mm Wg<br>Fan motor : 2.2 kW approx.<br>AHU as described above                      | 1   | Nos. |          | 76,421.00  | -                | 76,421.00        |
| 12    |         | FAN COIL UNITS (FCU'S) - CONCEALED, CEILING HUNG, HORIZONTAL TYPE - NORMAL STATIC (ONLY 3 ROW DEEP CHILLED WATER COIL) - ONE COIL ONLY   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|       |         | Supply, installation, testing & commissioning of ceiling suspended, horizontal type of blow through design, complete with *3 row deep copper tube and aluminum fins chilled water coil, very low noise centrifugal blower & motor, fabric filter, stainless steel duly insulated main & auxiliary drain pans, electrical terminal strip, copper pipes for coil connections, wiring in conduit upto thermostat box. The unit shall be complete with fire retardant flexible connection at the outlet. |     |      |          |           |                  |                  |
|       |         | The FCU motor shall be three speed type & shall be suitable for single phase, 220±6% volts, 50Hz electrical supply.  |     |      |          |           |                  |                  |
|       |         | The necessary supporting mechanism with GI suspension rods, GI channel, dash fastners & vibration isolators to be included. The FCU capacities shall be :  |     |      |          |           |                  |                  |
|       |         | TR                      CFM                      External Static                      Noise level @<br>2m distance<br><br>Pr. In MMWg  |     |      |          |           |                  |                  |
| 12.1  | NSR     | 1.0TR                      400                      4 - 5 mmWg                      35db (A)   | 5   | Nos. |          | 23,256.00 | -                | 116,280.00       |
| 12.2  | NSR     | 1.5TR                      600                      4 - 5 mmWg                      35db (A)   | 10  | Nos. |          | 25,582.00 | -                | 255,820.00       |
| 12.3  | NSR     | 2.0TR                      800                      4 - 5 mmWg                      35db (A)   | 9   | Nos. |          | 28,904.00 | -                | 260,136.00       |
| 12.4  | NSR     | 2.5TR                      1000                      4 - 5 mmWg                      35db (A)  | 1   | Nos. |          | 31,894.00 | -                | 31,894.00        |
| 13    | NSR     | TFA CUM HRW AIR HANDLING UNIT'S (AHU) - OUTDOOR, FLOOR MOUNTED   |     |      |          |           |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type, <b>THERMAL BREAK DESIGN</b> air handling unit (AHU) as per specifications & complete with the following:   |     |      |          |           |                  |                  |
| a.    |         | Pre-filter section with MERV-7 filters. (Synthetic fibre pre-filter) (for fresh air & return air)  |     |      |          |           |                  |                  |
| b     |         | Fine Filter section with MERV-14 filters. (for fresh air)  |     |      |          |           |                  |                  |
| c     |         | Ultra-Violet Germicidal irradiation(UVGI) Rod  |     |      |          |           |                  |                  |
| d     |         | Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.  |     |      |          |           |                  |                  |
|       |         | Heating coil section with 2 Row deep copper tubes & aluminum fins heating coil.  |     |      |          |           |                  |                  |
| e     |         | Heat Recovery Wheel section with molecular seive desicant rotor and its geared motor & drive package.  |     |      |          |           |                  |                  |
| f     |         | Supply air Fan section with Centrifugal fan, AMCA certified high efficiency fan, <b>Backward Curved Direct driven system</b> with fire retardant flexible connection at fan outlet.  |     |      |          |           |                  |                  |
| g     |         | Exhaust air Fan section with Centrifugal fan, AMCA certified high efficiency fan, <b>Backward Curved Direct driven system</b> with fire retardant flexible connection at fan outlet.   |     |      |          |           |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| h     |         | High efficiency 'IE3' squirrel cage induction motors suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.   |     |      |          |            |                  |                  |
| i.    |         | Fan & motors shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.  |     |      |          |            |                  |                  |
| j     |         | Dampers for fresh air intake, supply air and return/exhaust air (Motorised)   |     |      |          |            |                  |                  |
| k     |         | Unit mounted Electrical Control Panel in IP 55, weather proof design with incomer disconnect switch/MCCB, VFD for supply air fan, exhaust air fan & wheel motor and complete in all respects including safeties, interlocks, metering & indication, fully BMS compatible and as approved. |     |      |          |            |                  |                  |
| l     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.<br>The unit shall be BMS compatible.<br>The Unit selection shall be :  |     |      |          |            |                  |                  |
| 13.1  | NSR     | Cath-1&2 , VASC & EP LAB  |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:   |     |      |          |            |                  |                  |
|       |         | Summer Monsoon  |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH  |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:  |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling  |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:   |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT   |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:   |     |      |          |            |                  |                  |
|       |         | 4500 CFM 150 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:  |     |      |          |            |                  |                  |
|       |         | 1900 CFM 75 mm Wg Total SP  |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.   | 4   | Set  |          | 596,969.00 | -                | 2,387,876.00     |
| 13.2  | NSR     | IMG GUIDE   |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:   |     |      |          |            |                  |                  |
|       |         | Summer Monsoon  |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH  |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:  |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling  |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Supply Air Conditions after cooling coil:<br>54° F DBT & 55° F WBT |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:<br>119° F DBT            |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:<br>4800 CFM 150 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>1900 CFM 75 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.                          | 1   | Set  |          | 601,690.00 | -                | 601,690.00       |
| 13.3  | NSR     | SP OT-6  |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:  |     |      |          |            |                  |                  |
|       |         | Summer   |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH   |     |      |          |            |                  |                  |
|       |         | Monsoon  |     |      |          |            |                  |                  |
|       |         | 94° F DB & 60% RH  |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:   |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling                                       |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                                       |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:<br>54° F DBT & 55° F WBT |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:<br>119° F DBT            |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:<br>4000 CFM 150 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>4000 CFM 75 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.                          | 1   | Set  |          | 709,360.00 | -                | 709,360.00       |
| 13.4  | NSR     | MJ OT-1 & SP OT 5(Burns OT assumed)                                |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:  |     |      |          |            |                  |                  |
|       |         | Summer   |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH   |     |      |          |            |                  |                  |
|       |         | Monsoon  |     |      |          |            |                  |                  |
|       |         | 94° F DB & 60% RH  |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:   |     |      |          |            |                  |                  |
|       |         | 83° F DB & 70% RH in cooling                                       |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                                       |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:                          |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                                | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | 54° F DBT & 55° F WBT                           |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:       |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                      |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:                                 |     |      |          |            |                  |                  |
|       |         | 3800 CFM 150 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:                                |     |      |          |            |                  |                  |
|       |         | 950 CFM 75 mm Wg Total SP                       |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.       | 2   | Set  |          | 511,070.00 | -                | 1,022,140.00     |
| 13.5  | NSR     | MJ OT-2 to MJ OT-4 & MJ OT - 9 to 12, SP OT 1-4 |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                           |     |      |          |            |                  |                  |
|       |         | Summer Monsoon                                  |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH            |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                          |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling                    |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                    |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:       |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                           |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:       |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                      |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:                                 |     |      |          |            |                  |                  |
|       |         | 3800 CFM 150 mm Wg Total SP                     |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:                                |     |      |          |            |                  |                  |
|       |         | 950 CFM 75 mm Wg Total SP                       |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.       | 11  | Set  |          | 511,070.00 | -                | 5,621,770.00     |
| 13.6  | NSR     | MJ OT-5 to 7 & 13 to 16                         |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                           |     |      |          |            |                  |                  |
|       |         | Summer Monsoon                                  |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH            |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                          |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling                    |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                    |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:       |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                           |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Supply Air Conditions after heating coil:<br>119 <sup>0</sup> F DBT  |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:<br>4200 CFM 150 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>1000 CFM 75 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.  | 7   | Set  |          | 517,496.00 | -                | 3,622,472.00     |
| 13.7  | NSR     | MJ OT-8  |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:<br>Summer Monsoon<br>110 <sup>0</sup> F DB & 32% RH 94 <sup>0</sup> F DB & 60% RH        |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:<br>76 <sup>0</sup> F DB & 60% RH in cooling<br>70 <sup>0</sup> F DB & 60% RH in heating |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:<br>72 <sup>0</sup> F DB & 50% RH in cooling                          |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:<br>119 <sup>0</sup> F DBT  |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:<br>3700 CFM 150 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>3700 CFM 75 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.  | 1   | Set  |          | 697,950.00 | -                | 697,950.00       |
| 13.8  | NSR     | Sterile Core-1   |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:<br>Summer Monsoon<br>110 <sup>0</sup> F DB & 32% RH 94 <sup>0</sup> F DB & 60% RH        |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:<br>72 <sup>0</sup> F DB & 50% RH in cooling<br>70 <sup>0</sup> F DB & 60% RH in heating |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:<br>54 <sup>0</sup> F DBT & 55 <sup>0</sup> F WBT                     |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:  |     |      |          |            |                  |                  |



| S No. | Code No | Item Description                          | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | 119° F DBT                                |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:                           |     |      |          |            |                  |                  |
|       |         | 7200 CFM 150 mm Wg Total SP               |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:                          |     |      |          |            |                  |                  |
|       |         | 1750 CFM 75 mm Wg Total SP                |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above. | 1   | Set  |          | 748,966.00 | -                | 748,966.00       |
| 13.9  | NSR     | Sterile Core-2 & 3                        |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                     |     |      |          |            |                  |                  |
|       |         | Summer Monsoon                            |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH      |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                    |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling              |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating              |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil: |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                     |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil: |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:                           |     |      |          |            |                  |                  |
|       |         | 10200 CFM 150 mm Wg Total SP              |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:                          |     |      |          |            |                  |                  |
|       |         | 2450 CFM 75 mm Wg Total SP                |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above. | 2   | Set  |          | 873,553.00 | -                | 1,747,106.00     |
| 13.10 | NSR     | Sterile Core-4                            |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                     |     |      |          |            |                  |                  |
|       |         | Summer Monsoon                            |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH 94° F DB & 60% RH      |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                    |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling              |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating              |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil: |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                     |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil: |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                               | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Supply Air Fan:<br>9000 CFM 150 mm Wg Total SP |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>2150 CFM 75 mm Wg Total SP |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.      | 1   | Set  |          | 818,210.00 | -                | 818,210.00       |
| 13.11 | NSR     | OT Corridor-1 & 2                              |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                          |     |      |          |            |                  |                  |
|       |         | Summer   |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH                             |     |      |          |            |                  |                  |
|       |         | Monsoon  |     |      |          |            |                  |                  |
|       |         | 94° F DB & 60% RH                              |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                         |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling                   |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                   |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:      |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                          |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:      |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                     |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:<br>8700 CFM 150 mm Wg Total SP |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:<br>1850 CFM 75 mm Wg Total SP |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.      | 2   | Set  |          | 814,669.00 | -                | 1,629,338.00     |
| 13.12 | NSR     | Endoscopy                                      |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:                          |     |      |          |            |                  |                  |
|       |         | Summer   |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH                             |     |      |          |            |                  |                  |
|       |         | Monsoon  |     |      |          |            |                  |                  |
|       |         | 94° F DB & 60% RH                              |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:                         |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling                   |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating                   |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:      |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT                          |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:      |     |      |          |            |                  |                  |
|       |         | 119° F DBT                                     |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:                                |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | 4400 CFM 150 mm Wg Total SP Exhaust Air Fan:   |     |      |          |            |                  |                  |
|       |         | 950 CFM 75 mm Wg Total SP  |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.  | 1   | Set  |          | 544,249.00 | -                | 544,249.00       |
| 13.13 | NSR     | OT Corridor-3  |     |      |          |            |                  |                  |
|       |         | Fresh Air Conditions:  |     |      |          |            |                  |                  |
|       |         | Summer   |     |      |          |            |                  |                  |
|       |         | 110° F DB & 32% RH   |     |      |          |            |                  |                  |
|       |         | Monsoon  |     |      |          |            |                  |                  |
|       |         | 94° F DB & 60% RH  |     |      |          |            |                  |                  |
|       |         | Return Air Conditions:   |     |      |          |            |                  |                  |
|       |         | 72° F DB & 50% RH in cooling   |     |      |          |            |                  |                  |
|       |         | 70° F DB & 60% RH in heating   |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after cooling coil:  |     |      |          |            |                  |                  |
|       |         | 54° F DBT & 55° F WBT  |     |      |          |            |                  |                  |
|       |         | Supply Air Conditions after heating coil:  |     |      |          |            |                  |                  |
|       |         | 119° F DBT   |     |      |          |            |                  |                  |
|       |         | Supply Air Fan:  |     |      |          |            |                  |                  |
|       |         | 8300 CFM 150 mm Wg Total SP  |     |      |          |            |                  |                  |
|       |         | Exhaust Air Fan:   |     |      |          |            |                  |                  |
|       |         | 1750 CFM 75 mm Wg Total SP   |     |      |          |            |                  |                  |
|       |         | TFA cum HRW AHU Units as discussed above.  | 1   | Set  |          | 735,589.00 | -                | 735,589.00       |
|       |         | Note:  |     |      |          |            |                  |                  |
|       |         | Necessary civil work such as plinth / foundation / base for AHU mounting is excluded from scope of work.   |     |      |          |            |                  |                  |
| 14    |         | TFA AIR HANDLING UNIT'S (AHU) - OUTDOOR, FLOOR MOUNTED   |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , sectionalized construction, draw through type, <b>THERMAL BREAK DESIGN</b> air handling unit (AHU) as per specifications & complete with the following: |     |      |          |            |                  |                  |
| a.    |         | Pre-filter section with MERV-7 filters.(Synthetic fibre pre-filter)  |     |      |          |            |                  |                  |
| b.    |         | Fine Filter section with MERV-14 filters.  |     |      |          |            |                  |                  |
| c.    |         | Cooling coil section with <b>8 Row deep</b> copper tubes & aluminum fins cooling coil.   |     |      |          |            |                  |                  |
| d.    |         | Fan section with Centrifugal fan, AMCA certified high efficiency fan, <b>Backward Curved</b> with fire retardant flexible connection at fan outlet.  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| e     |         | High efficiency 'IE3' squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package. |     |      |          |            |                  |                  |
| f     |         | Fan & motor shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.                                |     |      |          |            |                  |                  |
| g     |         | The unit shall be provided with water resistance marine light and limit switch with power cabling.<br>The unit shall be BMS compatible.<br>The AHU selection shall be :                                |     |      |          |            |                  |                  |
|       |         | AYUSH BLOCK  |     |      |          |            |                  |                  |
| 14.1  | NSR     | Air Quantity : 1400 CFM (9.4 TR)<br>Total Static Pressure : 70 mm Wg<br>Fan motor : 1.5 kW approx.<br>TFA as described above   | 2   | Nos. |          | 105,047.00 | -                | 210,094.00       |
| 14.2  | NSR     | Air Quantity : 1600 CFM (11 TR)<br>Total Static Pressure : 70 mm Wg<br>Fan motor : 1.5 kW approx.<br>TFA as described above  | 2   | Nos. |          | 107,670.00 | -                | 215,340.00       |
|       |         | ACADEMIC BLOCK   |     |      |          |            |                  |                  |
| 14.3  |         | TFA-1<br>Air Quantity : 4100 CFM (28.2 TR)<br>Total Static Pressure : 70 mm Wg<br>Fan motor : 3.7 kW approx.<br>TFA as described above   | 1   | Nos. |          | 212,978.00 | -                | 212,978.00       |
| 14.4  |         | TFA-2<br>Air Quantity : 4700 CFM (32.5 TR)<br>Total Static Pressure : 70 mm Wg<br>Fan motor : 3.7 kW approx.<br>TFA as described above   | 1   | Nos. |          | 226,486.00 | -                | 226,486.00       |
| 14.5  |         | TFA-1<br>Air Quantity : 14400 CFM (100.1 TR)<br>Total Static Pressure : 70 mm Wg<br>Fan motor : 11 kW approx.<br>TFA as described above  | 1   | Nos. |          | 484,841.00 | -                | 484,841.00       |
| 14.6  |         | TFA-2<br>Air Quantity : 9300 CFM (64.8 TR)   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description                  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|-----------------------------------|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2                                 | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 329,435.00 | -                | 329,435.00       |
| 14.7  |         | TFA-1                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 8200 CFM (57.1 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 320,648.00 | -                | 320,648.00       |
| 14.8  |         | TFA-2                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 7900 CFM (54.8 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 7.5 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 317,501.00 | -                | 317,501.00       |
| 14.9  |         | TFA-1                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 4000 CFM (27.5 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 3.7 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 188,717.00 | -                | 188,717.00       |
| 14.10 |         | TFA-2                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 2500 CFM (17.5 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 2.2 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 137,308.00 | -                | 137,308.00       |
| 14.11 |         | TFA-1                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 5500 CFM (38.3 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 248,650.00 | -                | 248,650.00       |
| 14.12 |         | TFA-2                             |     |      |          |            |                  |                  |
|       |         | Air Quantity : 5600 CFM (39.1 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 5.5 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 1   | Nos. |          | 249,961.00 | -                | 249,961.00       |
| 14.13 |         | TFA-1 & 2                         |     |      |          |            |                  |                  |
|       |         | Air Quantity : 3000 CFM (19.5 TR) |     |      |          |            |                  |                  |
|       |         | Total Static Pressure : 70 mm Wg  |     |      |          |            |                  |                  |
|       |         | Fan motor : 2.2 kW approx.        |     |      |          |            |                  |                  |
|       |         | TFA as described above            | 2   | Nos. |          | 154,750.00 | -                | 309,500.00       |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 16.2  |         | 4500 cfm 100 mmWg 5.5 KW   | 1   | Nos. |          | 379,134.00 | -                | 379,134.00       |
| 16.3  |         | 9000 cfm 100 mmWg 11 KW  | 1   | Nos. |          | 569,052.00 | -                | 569,052.00       |
| 17    | NSR     | AIR WASHERS  |     |      |          |            |                  |                  |
|       |         | Supply, installation, testing & commissioning of Double skin construction, floor mounted, packaged air washer, draw through design type, complete with metallic pre-filters, wetting pad section with 200mm thick cellulose based paper fill, 2 bend PVC water eliminators, water distribution system comprising, spray header, water tank, brass mesh screen strainer, tank with quickfill, makeup float, drain & over flow and water pump. Fan section with backward curved DIDW Centrifugal blower with 3 Phase, TEFC, Sq. cage induction motor suitable for 415V±10%V & 50Hz±3% electric supply. Motor shall be of high efficiency class i.e. 'IE3' type and suitable for VFD operation and complete with VFD drive package. Fan and Motor shall be mounted on a common base frame with adjustable slide rails for motor and complete base frame mounted on the AHU casing with spring isolators. Fan outlet shall have a fire retardant canvass connection. |     |      |          |            |                  |                  |
|       |         | Fan shall be AMCA Certified.   |     |      |          |            |                  |                  |
|       |         | The Air washer units shall be of following duty :  |     |      |          |            |                  |                  |
|       |         | Air Qty in CFM Total Static Pressure Approx. fan<br>Approx. Pump in mmWg Motor HP/KW<br>motor HP / KW  |     |      |          |            |                  |                  |
| 17.1  |         | 18600 cfm 50mmWg 11KW 0.8KW  | 4   | Nos. |          | 300,610.00 | -                | 1,202,440.00     |
| 17.2  |         | 9500 cfm 50mmWg 5.5KW 0.6KW  | 3   | Nos. |          | 161,759.00 | -                | 485,277.00       |
| 17.3  |         | 4000 cfm 50mmWg 2.2KW<br>0.8KW   | 1   | Nos. |          | 86,188.00  | -                | 86,188.00        |
| 17.4  |         | 8100 cfm 50mmWg 5.5KW<br>1.1KW   | 1   | Nos. |          | 156,172.00 | -                | 156,172.00       |
| 18    | NSR     | VENTILATION UNITS  |     |      |          |            |                  |                  |
| 18.1  |         | Supply, installation, testing & commissioning of <b>DOUBLE SKIN, FLOOR MOUNTED</b> , Sectionalized construction, outdoor construction, Ventilation Unit as per specifications and complete with the following:   |     |      |          |            |                  |                  |
| a.    |         | Fan section with DIDW Centrifugal fan, AMCA certified high efficiency fan, Forward Curved blower with fire retardant canvass connection at fan inlet.  |     |      |          |            |                  |                  |
| b.    |         | High efficiency class 'IE3' squirrel cage induction motor suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be suitable for VFD operation. It shall be complete with V-Belt drive package.   |     |      |          |            |                  |                  |

| S No.   | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| c.      |         | Fan & motors shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the Ventilation Unit casing with vibration isolation spring isolators. |     |      |          |            |                  |                  |
|         |         | The Ventilation Unit Selection Shall be:  |     |      |          |            |                  |                  |
|         |         | IPD BLOCK (Toilet & Laundry Exhaust)  |     |      |          |            |                  |                  |
|         |         | Ventilation Unit      CFM      Total SP in mmWg      Approx. Motor HP / KW  |     |      |          |            |                  |                  |
| 18.1.1  |         | For Toilet Set-1      3600      40      2.2KW   | 1   | Nos. |          | 61,934.00  | -                | 61,934.00        |
| 18.1.2  |         | For Toilet Set-2      4000      40      2.2KW   | 1   | Nos. |          | 68,815.00  | -                | 68,815.00        |
| 18.1.3  |         | For Toilet Set-1      4200      40      2.2KW   | 1   | Nos. |          | 72,256.00  | -                | 72,256.00        |
| 18.1.4  |         | For Toilet Set-2      5500      40      3.7KW   | 1   | Nos. |          | 94,621.00  | -                | 94,621.00        |
| 18.1.5  |         | For Toilet Set-3      5300      40      3.7KW   | 1   | Nos. |          | 91,180.00  | -                | 91,180.00        |
| 18.1.6  |         | For Toilet Set-4      5400      40      3.7KW   | 1   | Nos. |          | 92,900.00  | -                | 92,900.00        |
| 18.1.7  |         | For Toilet Set-5      4200      40      2.2KW   | 1   | Nos. |          | 72,256.00  | -                | 72,256.00        |
| 18.1.8  |         | For Toilet Set-1      1600      40      1.1KW   | 2   | Nos. |          | 44,333.00  | -                | 88,666.00        |
| 18.1.9  |         | For Laundry      10500      40      5.5KW   | 3   | Nos. |          | 170,317.00 | -                | 510,951.00       |
|         |         | ACADEMIC & DHARAMSHALA BLOCK (Toilet Exhaust)   |     |      |          |            |                  |                  |
|         |         | Ventilation Unit      CFM      Total SP in mmWg      Approx. Motor HP / KW  |     |      |          |            |                  |                  |
| 18.1.10 |         | For Auditorium      5500      40      3.75KW  | 1   | Nos. |          | 94,621.00  | -                | 94,621.00        |
| 18.1.11 |         | For Admin & Library      3800      40      2.2KW  | 1   | Nos. |          | 68,815.00  | -                | 68,815.00        |
| 18.1.12 |         | For Admin & Library      2500      40      1.5KW  | 3   | Nos. |          | 57,566.00  | -                | 172,698.00       |
| 18.1.13 |         | For Medical College      6000      40      3.75KW   | 2   | Nos. |          | 92,900.00  | -                | 185,800.00       |
| 18.1.14 |         | For Medical Lab      6000      40      3.75KW   | 2   | Nos. |          | 92,900.00  | -                | 185,800.00       |
| 18.1.15 |         | For Nursing College      3800      40      2.2KW  | 1   | Nos. |          | 68,815.00  | -                | 68,815.00        |
| 18.1.16 |         | For Nursing College      2500      40      2.2KW  | 1   | Nos. |          | 57,566.00  | -                | 57,566.00        |
| 18.1.17 |         | For Shared Lab      3800      40      2.2KW   | 2   | Nos. |          | 68,815.00  | -                | 137,630.00       |
| 18.1.18 |         | For Dharmashala      3000      40      1.5KW  | 1   | Nos. |          | 57,566.00  | -                | 57,566.00        |
| 18.2    | NSR     | Supply, installation, testing & commissioning of <b>Propeller Fans</b> of metallic body complete with fan speed regulator, gravity louvers & bird screen as per specifications.       |     |      |          |            |                  |                  |
| 18.2.1  |         | 200 mm mm dia, single phase   | 126 | Nos. |          | 4,680.00   | -                | 589,680.00       |
| 18.2.2  |         | 300 mm mm dia, single phase   | 6   | Nos. |          | 5,765.00   | -                | 34,590.00        |
| 18.3    | NSR     | INLINE FANS   |     |      |          |            |                  |                  |
|         |         | Supply, installation, testing & commissioning of Inline Fans complete with fan speed regulator, gravity louvers & bird screen as per specifications.                                  |     |      |          |            |                  |                  |
| 18.3.1  |         | 500 cfm, Static Pressure in mmWg : 25, single phase   | 11  | Nos. |          | 11,666.00  | -                | 128,326.00       |



| S No.   | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 18.3.2  |         | 300 cfm, Static Pressure in mmWg : 25, single phase  | 33  | Nos. |          | 8,275.00   | -                | 273,075.00       |
| 18.3.3  |         | 200 cfm, Static Pressure in mmWg : 25, single phase  | 11  | Nos. |          | 8,275.00   | -                | 91,025.00        |
| 18.3.4  |         | 150 cfm, Static Pressure in mmWg : 25, single phase  | 7   | Nos. |          | 6,647.00   | -                | 46,529.00        |
| 18.3.5  |         | 600 cfm, Static Pressure in mmWg : 25, single phase  | 5   | Nos. |          | 11,666.00  | -                | 58,330.00        |
| 18.3.6  |         | 700 cfm, Static Pressure in mmWg : 25, single phase  | 35  | Nos. |          | 13,728.00  | -                | 480,480.00       |
| 18.3.7  |         | 800 cfm, Static Pressure in mmWg : 25, single phase  | 3   | Nos. |          | 20,591.00  | -                | 61,773.00        |
| 18.3.8  |         | 900 cfm, Static Pressure in mmWg : 25, single phase  | 7   | Nos. |          | 20,591.00  | -                | 144,137.00       |
| 18.3.9  |         | 1000 cfm, Static Pressure in mmWg : 25, single phase   | 6   | Nos. |          | 20,591.00  | -                | 123,546.00       |
| 18.3.10 |         | 1100 cfm, Static Pressure in mmWg : 25, single phase   | 9   | Nos. |          | 20,591.00  | -                | 185,319.00       |
| 18.3.11 |         | 1200 cfm, Static Pressure in mmWg : 25, single phase   | 1   | Nos. |          | 22,504.00  | -                | 22,504.00        |
| 18.3.12 |         | 1700 cfm, Static Pressure in mmWg : 25, single phase   | 1   | Nos. |          | 24,471.00  | -                | 24,471.00        |
| 18.3.13 |         | 2100 cfm, Static Pressure in mmWg : 25, single phase   | 5   | Nos. |          | 24,471.00  | -                | 122,355.00       |
| 18.4    | NSR     | Supply, installation, testing & commissioning of <b>Propeller Fans</b> of metallic body complete with fan speed regulator, gravity louvers & bird screen as per specifications.  |     |      |          |            |                  |                  |
| 18.4.1  |         | 200 mm mm dia, single phase  | 2   | Nos. |          | 4,680.00   | -                | 9,360.00         |
| 18.4.2  |         | 300 mm mm dia, single phase  | 39  | Nos. |          | 5,765.00   | -                | 224,835.00       |
| 18.5    | NSR     | <b>VANE AXIAL FLOW FAN FOR EXHAUST</b><br>Supply, installation, testing & commissioning of Vane Axial Fan with impeller having adjustable pitch angle blades and complete with suitable motor & drive assembly. Motor shall also be suitable for variable Speed drive & shall be high efficiency Class IE3. Motor shall be suitable for 415 ± 10% V, 3 Phase, 4 Wire, 50 ± 3%Hz electrical supply. Fans shall be AMCA certified (AMCA 210 for air performance & AMCA 300 for sound). The price shall include all accessories & all necessary vibration isolation system, fire rated flexible canvass connections, mounting frames, hangers, supports, nut & bolts etc.<br>Fan shall be AMCA certified. |     |      |          |            |                  |                  |
|         |         | The complete fan assembly alongwith the motor & drive assembly shall be fire rated i.e. suitable to operate upto 250°C for 2 hours and meet the duty parameters. The fan duty shall be :   |     |      |          |            |                  |                  |
| 18.5.1  | NSR     | Space served : LT Panel Room (Basement)  |     |      |          |            |                  |                  |
|         |         | Air Qty : 11600 CFM  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|         |         | Fan motor : 3.75 kW approx.  |     |      |          |            |                  |                  |
|         |         | Fan dia : 710 mm approx.   |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|         |         | Fan duty : Normal & Smoke Exhaust  |     |      |          |            |                  |                  |
|         |         | Fan as described above.  | 1   | Nos. |          | 129,142.00 | -                | 129,142.00       |
| 18.5.2  | NSR     | Space served : UPS Room (Basement)   |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|        |         | Air Qty : 8000 CFM                                  |     |      |          |           |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |           |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|        |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|        |         | Fan duty : Normal & Smoke Exhaust                   |     |      |          |           |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 89,064.00 | -                | 89,064.00        |
| 18.5.3 | NSR     | Space served : Spare Room LT Panel (Basement)       |     |      |          |           |                  |                  |
|        |         | Air Qty : 3000 CFM                                  |     |      |          |           |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |           |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |           |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|        |         | Fan duty : Normal & Smoke Exhaust                   |     |      |          |           |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00 | -                | 41,625.00        |
| 18.5.4 | NSR     | Space served : Spare Room UPS (Basement)            |     |      |          |           |                  |                  |
|        |         | Air Qty : 3000 CFM                                  |     |      |          |           |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |           |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |           |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|        |         | Fan duty : Normal & Smoke Exhaust                   |     |      |          |           |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 33,591.00 | -                | 33,591.00        |
| 18.5.5 | NSR     | Space served : Corridor Lower (Basement)            |     |      |          |           |                  |                  |
|        |         | Air Qty : 10000 CFM                                 |     |      |          |           |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |           |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|        |         | Fan motor : 3.75 kW approx.                         |     |      |          |           |                  |                  |
|        |         | Fan dia : 710 mm approx.                            |     |      |          |           |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|        |         | Fan duty : Normal & Smoke Exhaust                   |     |      |          |           |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 62,794.00 | -                | 62,794.00        |
| 18.5.6 | NSR     | Space served : Corridor Upper (Basement)            |     |      |          |           |                  |                  |
|        |         | Air Qty : 8500 CFM                                  |     |      |          |           |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |           |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|        |         | Fan motor : 3.75 kW approx.                         |     |      |          |           |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Fan duty : Normal & Smoke Exhaust  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 62,794.00  | -                | 62,794.00        |
| 18.5.7 | NSR     | Space served : Corridor Middle (Basement)  |     |      |          |            |                  |                  |
|        |         | Air Qty : 4500 CFM   |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 2.2 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Exhaust  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 36,744.00  | -                | 36,744.00        |
|        |         | Note   |     |      |          |            |                  |                  |
|        |         | Fan to have safety wire mesh screen on any exposed face.   |     |      |          |            |                  |                  |
| 18.6   | NSR     | VANE AXIAL FLOW FAN FOR FRESH AIR SUPPLY   |     |      |          |            |                  |                  |
|        |         | Supply, installation, testing & commissioning of Vane Axial Fan with impeller having adjustable pitch angle blades and complete with suitable motor & drive assembly. Motor shall also be suitable for variable Speed drive & shall be high efficiency Class IE3. Motor shall be suitable for 415 ± 10% V, 3 Phase, 4 Wire, 50 ± 3%Hz electrical supply. Fans shall be AMCA certified (AMCA 210 for air performance & AMCA 300 for sound). The price shall include all accessories & all necessary vibration isolation system, fire rated flexible canvass connections, mounting frames, hangers, supports, nut & bolts etc. |     |      |          |            |                  |                  |
|        |         | Fan shall be AMCA certified.   |     |      |          |            |                  |                  |
| 18.6.1 | NSR     | Space served : LT Panel Room (Basement)  |     |      |          |            |                  |                  |
|        |         | Air Qty : 11600 CFM  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.75 kW approx.  |     |      |          |            |                  |                  |
|        |         | Fan dia : 710 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 129,142.00 | -                | 129,142.00       |
| 18.6.2 | NSR     | Space served : UPS Room (Basement)   |     |      |          |            |                  |                  |
|        |         | Air Qty : 8000 CFM   |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 2.2 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Fan duty : Normal & Smoke Fresh air                 |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 89,064.00  | -                | 89,064.00        |
| 18.6.3 | NSR     | Space served : Spare Room LT Panel (Basement)       |     |      |          |            |                  |                  |
|        |         | Air Qty : 3000 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air                 |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00  | -                | 41,625.00        |
| 18.6.4 | NSR     | Space served : Spare Room UPS (Basement)            |     |      |          |            |                  |                  |
|        |         | Air Qty : 3000 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air                 |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00  | -                | 41,625.00        |
| 18.6.5 | NSR     | Space served : Corridor Lower (Basement)            |     |      |          |            |                  |                  |
|        |         | Air Qty : 10000 CFM                                 |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.75 kW approx.                         |     |      |          |            |                  |                  |
|        |         | Fan dia : 710 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air                 |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 111,330.00 | -                | 111,330.00       |
| 18.6.6 | NSR     | Space served : Corridor Upper (Basement)            |     |      |          |            |                  |                  |
|        |         | Air Qty : 8500 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.75 kW approx.                         |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air                 |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 94,630.00  | -                | 94,630.00        |
| 18.6.7 | NSR     | Space served : Corridor Middle (Basement)           |     |      |          |            |                  |                  |
|        |         | Air Qty : 4500 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg                    |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 2.2 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Normal & Smoke Fresh air  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 62,438.00  | -                | 62,438.00        |
| 18.7   | NSR     | TUBE AXIAL FLOW FANS FOR SMOKE EXHAUST   |     |      |          |            |                  |                  |
|        |         | Supply, installation, testing & commissioning of Tube Axial Fan with impeller having adjustable pitch angle blades and complete with suitable motor & drive assembly. Motor shall also be suitable for fixed Speed drive & shall be high efficiency Class IE3. Motor shall be suitable for 415 ± 10% V, 3 Phase, 4 Wire, 50 ± 3%Hz electrical supply. Fans shall be AMCA certified (AMCA 210 for air performance & AMCA 300 for sound). The price shall include all accessories & all necessary vibration isolation system, fire rated flexible canvass connections, mounting frames, hangers, supports, nut & bolts etc. Fan shall be AMCA certified. |     |      |          |            |                  |                  |
|        |         | The complete fan assembly alongwith the motor & drive assembly shall be fire rated i.e. suitable to operate upto 250°C for 2 hours and meet the duty parameters. The fan duty shall be :   |     |      |          |            |                  |                  |
| 18.7.1 | NSR     | Smoke Exhaust-1  |     |      |          |            |                  |                  |
|        |         | Air Qty : 43200 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 4   | Nos. |          | 219,072.00 | -                | 876,288.00       |
| 18.7.2 | NSR     | Smoke Exhaust-2  |     |      |          |            |                  |                  |
|        |         | Air Qty : 45720 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 4   | Nos. |          | 303,386.00 | -                | 1,213,544.00     |
| 18.7.3 | NSR     | Smoke Exhaust-3  |     |      |          |            |                  |                  |
|        |         | Air Qty : 54000 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 2   | Nos. |          | 328,176.00 | -                | 656,352.00       |

| S No.  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 18.7.4 | NSR     | Smoke Venting - Ayush Block<br>Air Qty : 10000 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 3.7 kW approx.<br>Fan dia : 710 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                      | 2   | Nos. |          | 111,330.00 | -                | 222,660.00       |
| 18.7.5 | NSR     | Smoke Venting - Ayush Block<br>Air Qty : 12000 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 3.7 kW approx.<br>Fan dia : 710 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                      | 2   | Nos. |          | 133,596.00 | -                | 267,192.00       |
| 18.7.6 | NSR     | FOR ACADEMIC BLOCK<br>Smoke Venting - Exam Hall-1<br>Air Qty : 4600 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.5 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above. | 1   | Nos. |          | 62,438.00  |                  |                  |
| 18.7.7 | NSR     | Smoke Venting - Exam Hall-2<br>Air Qty : 4585 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.5 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                       | 1   | Nos. |          | 62,438.00  | -                | 62,438.00        |
| 18.7.8 | NSR     | Smoke Venting - Auditorium<br>Air Qty : 26150 CFM<br>Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 7.5 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 1120 mm approx.                           |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 3   | Nos. |          | 282,717.00 | -                | 848,151.00       |
| 18.7.9  | NSR     | Smoke Venting - Prefunction                         |     |      |          |            |                  |                  |
|         |         | Air Qty : 35200 CFM                                 |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 11 kW approx.                           |     |      |          |            |                  |                  |
|         |         | Fan dia : 1250 mm approx.                           |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 384,608.00 | -                | 384,608.00       |
| 18.7.10 | NSR     | Smoke Venting - Ground floor-1                      |     |      |          |            |                  |                  |
|         |         | Air Qty : 6250 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 86,025.00  | -                | 86,025.00        |
| 18.7.11 | NSR     | Smoke Venting - Ground floor-2                      |     |      |          |            |                  |                  |
|         |         | Air Qty : 7000 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 86,025.00  | -                | 86,025.00        |
| 18.7.12 | NSR     | Smoke Venting - First floor-1                       |     |      |          |            |                  |                  |
|         |         | Air Qty : 6300 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 86,025.00  | -                | 86,025.00        |

| S No.   | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 18.7.13 | NSR     | Smoke Venting - First floor-2<br>Air Qty : 11900 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 710 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                        | 1   | Nos. |          | 132,482.00 | -                | 132,482.00       |
| 18.7.14 | NSR     | Smoke Venting - Second floor-1&2<br>Air Qty : 2600 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.1 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                      | 2   | Nos. |          | 41,625.00  | -                | 83,250.00        |
| 18.7.15 | NSR     | (Medical College)<br>Smoke Venting - Ground floor-1&2<br>Air Qty : 2200 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.1 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above. | 2   | Nos. |          | 41,625.00  | -                | 83,250.00        |
| 18.7.16 | NSR     | Smoke Venting - Third floor-1<br>Air Qty : 2200 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.1 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.                         | 1   | Nos. |          | 41,625.00  | -                | 41,625.00        |
| 18.7.17 | NSR     | (Medical Lab)<br>Smoke Venting - Ground floor-1&2<br>Air Qty : 5200 CFM<br>Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |



| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 72,200.00 | -                | 144,400.00       |
| 18.7.18 | NSR     | Smoke Venting - Ground floor-3                      |     |      |          |           |                  |                  |
|         |         | Air Qty : 6900 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 95,705.00 | -                | 95,705.00        |
| 18.7.19 | NSR     | Smoke Venting - First floor-1                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00 | -                | 41,625.00        |
| 18.7.20 | NSR     | Smoke Venting - Second floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.7.21 | NSR     | Smoke Venting - Third floor-1                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00 | -                | 41,625.00        |

| S No.   | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
| 18.7.22 | NSR     | Smoke Venting - Fourth floor-1&2<br>Air Qty : 2200 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.1 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above. | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.7.23 | NSR     | Smoke Venting - Ground floor-1<br>Air Qty : 5300 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 2.2 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.   | 1   | Nos. |          | 61,231.00 | -                | 61,231.00        |
| 18.7.24 | NSR     | Smoke Venting - First floor-1<br>Air Qty : 6500 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 3.8 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.    | 1   | Nos. |          | 90,188.00 | -                | 90,188.00        |
| 18.7.25 | NSR     | Smoke Venting - First floor-2<br>Air Qty : 6300 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 2.2 kW approx.<br>Fan dia : 630 mm approx.<br>Noise level : not exceeding 75 db at 3.0m from fan.<br>Fan duty : Smoke Exhaust<br>Fan as described above.    | 1   | Nos. |          | 88,817.00 | -                | 88,817.00        |
| 18.7.26 | NSR     | Smoke Venting - Second floor-1&2<br>Air Qty : 2500 CFM<br>Total Static Pressure : 20 mm Wg<br>Fan Speed : 2850 RPM<br>Fan motor : 1.1 kW approx.   |     |      |          |           |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 38,883.00 | -                | 77,766.00        |
| 18.7.27 | NSR     | Smoke Venting - Ground floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 5100 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 70,746.00 | -                | 141,492.00       |
| 18.7.28 | NSR     | Smoke Venting - First floor-1&2                     |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.7.29 | NSR     | Smoke Venting - First floor-3                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 3400 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.5 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 47,406.00 | -                | 47,406.00        |
| 18.7.30 | NSR     | Smoke Venting - First floor-4                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 6600 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Exhaust                            |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 92,963.00 | -                | 92,963.00        |
| 18.7.31 | NSR     | Smoke Venting - Second floor-1,2&3                  |     |      |          |           |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Air Qty : 2200 CFM   |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.1 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 3   | Nos. |          | 41,625.00  | -                | 124,875.00       |
|        |         | Note   |     |      |          |            |                  |                  |
|        |         | Fan to have safety wire mesh screen on any exposed face.   |     |      |          |            |                  |                  |
| 18.8   | NSR     | TUBE AXIAL FLOW FANS FOR SMOKE FRESH AIR SUPPLY  |     |      |          |            |                  |                  |
|        |         | Supply, installation, testing & commissioning of Tube Axial Fan with impeller having adjustable pitch angle blades and complete with suitable motor & drive assembly. Motor shall also be suitable for variable Speed drive & shall be high efficiency Class IE3. Motor shall be suitable for 415 ± 10% V, 3 Phase, 4 Wire, 50 ± 3%Hz electrical supply. Fans shall be AMCA certified (AMCA 210 for air performance & AMCA 300 for sound). The price shall include all accessories & all necessary vibration isolation system, fire rated flexible canvass connections, mounting frames, hangers, supports, nut & bolts etc. Fans shall be AMCA certified. |     |      |          |            |                  |                  |
| 18.8.1 | NSR     | Smoke Fresh Air-1  |     |      |          |            |                  |                  |
|        |         | Air Qty : 43200 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 4   | Nos. |          | 219,072.00 | -                | 876,288.00       |
| 18.8.2 | NSR     | Smoke Fresh Air-2  |     |      |          |            |                  |                  |
|        |         | Air Qty : 30500 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 5.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Exhaust   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 10  | Nos. |          | 303,386.00 | -                | 3,033,860.00     |
| 18.8.3 | NSR     | Smoke Fresh Air-3  |     |      |          |            |                  |                  |
|        |         | Air Qty : 18000 cmh  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.7 kW approx.   |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Fan duty : Smoke Exhaust                            |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 10  | Nos. |          | 328,176.00 | -                | 3,281,760.00     |
| 18.8.4 | NSR     | Smoke Venting - Ayush Block                         |     |      |          |            |                  |                  |
|        |         | Air Qty : 10000 CFM                                 |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.7 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 710 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 2   | Nos. |          | 111,330.00 | -                | 222,660.00       |
| 18.8.5 | NSR     | Smoke Venting - Ayush Block                         |     |      |          |            |                  |                  |
|        |         | Air Qty : 12000 CFM                                 |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 3.7 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 710 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 2   | Nos. |          | 133,596.00 | -                | 267,192.00       |
| 18.8.6 | NSR     | FOR ACADEMIC BLOCK<br>Smoke Venting - Exam Hall-1   |     |      |          |            |                  |                  |
|        |         | Air Qty : 4600 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 62,438.00  | -                | 62,438.00        |
| 18.8.7 | NSR     | Smoke Venting - Exam Hall-2                         |     |      |          |            |                  |                  |
|        |         | Air Qty : 4585 CFM                                  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.5 kW approx.                          |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|        |         | Fan as described above.                             | 1   | Nos. |          | 62,438.00  | -                | 62,438.00        |
| 18.8.8 | NSR     | Smoke Venting - Auditorium                          |     |      |          |            |                  |                  |
|        |         | Air Qty : 26150 CFM                                 |     |      |          |            |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 7.5 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 1120 mm approx.                           |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 3   | Nos. |          | 282,717.00 | -                | 848,151.00       |
| 18.8.9  | NSR     | Smoke Venting - Prefunction                         |     |      |          |            |                  |                  |
|         |         | Air Qty : 35200 CFM                                 |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 11 kW approx.                           |     |      |          |            |                  |                  |
|         |         | Fan dia : 1250 mm approx.                           |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 384,608.00 | -                | 384,608.00       |
| 18.8.10 | NSR     | Smoke Venting - Ground floor-1                      |     |      |          |            |                  |                  |
|         |         | Air Qty : 6250 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 86,025.00  | -                | 86,025.00        |
| 18.8.11 | NSR     | Smoke Venting - Ground floor-2                      |     |      |          |            |                  |                  |
|         |         | Air Qty : 7000 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 86,025.00  | -                | 86,025.00        |
| 18.8.12 | NSR     | Smoke Venting - First floor-1                       |     |      |          |            |                  |                  |
|         |         | Air Qty : 6300 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|         |         | Fan as described above.                             | 1   | Nos. |          | 81,912.00  | -                | 81,912.00        |
| 18.8.13 | NSR     | Smoke Venting - First floor-2                       |     |      |          |            |                  |                  |
|         |         | Air Qty : 11900 CFM                                 |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 5.5 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 710 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 132,482.00 | -                | 132,482.00       |
| 18.8.14 | NSR     | Smoke Venting - Second floor-1&2                    |     |      |          |            |                  |                  |
|         |         | Air Qty : 2600 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00  | -                | 83,250.00        |
| 18.8.15 | NSR     | Smoke Venting - Ground floor-1&2                    |     |      |          |            |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00  | -                | 83,250.00        |
| 18.8.16 | NSR     | Smoke Venting - Third floor-1                       |     |      |          |            |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |            |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |            |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |            |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |            |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |            |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00  | -                | 41,625.00        |
| 18.8.17 | NSR     | Smoke Venting - Ground floor-1&2                    |     |      |          |            |                  |                  |
|         |         | Air Qty : 5200 CFM                                  |     |      |          |            |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |            |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |            |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 72,200.00 | -                | 144,400.00       |
| 18.8.18 | NSR     | Smoke Venting - Ground floor-3                      |     |      |          |           |                  |                  |
|         |         | Air Qty : 6900 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 95,705.00 | -                | 95,705.00        |
| 18.8.19 | NSR     | Smoke Venting - First floor-1                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00 | -                | 41,625.00        |
| 18.8.20 | NSR     | Smoke Venting - Second floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.8.21 | NSR     | Smoke Venting - Third floor-1                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 41,625.00 | -                | 41,625.00        |



| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
| 18.8.22 | NSR     | Smoke Venting - Fourth floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.8.23 | NSR     | Smoke Venting - Ground floor-1                      |     |      |          |           |                  |                  |
|         |         | Air Qty : 5300 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 61,231.00 | -                | 61,231.00        |
| 18.8.24 | NSR     | Smoke Venting - First floor-1                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 6500 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 90,188.00 | -                | 90,188.00        |
| 18.8.25 | NSR     | Smoke Venting - First floor-2                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 6300 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 88,817.00 | -                | 88,817.00        |
| 18.8.26 | NSR     | Smoke Venting - Second floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 2500 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |

| S No.   | Code No | Item Description                                    | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 38,883.00 | -                | 77,766.00        |
| 18.8.27 | NSR     | Smoke Venting - Ground floor-1&2                    |     |      |          |           |                  |                  |
|         |         | Air Qty : 5100 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 2.2 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 70,746.00 | -                | 141,492.00       |
| 18.8.28 | NSR     | Smoke Venting - First floor-1&2                     |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.1 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 2   | Nos. |          | 41,625.00 | -                | 83,250.00        |
| 18.8.29 | NSR     | Smoke Venting - First floor-3                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 3400 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 2850 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 1.5 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 47,406.00 | -                | 47,406.00        |
| 18.8.30 | NSR     | Smoke Venting - First floor-4                       |     |      |          |           |                  |                  |
|         |         | Air Qty : 6600 CFM                                  |     |      |          |           |                  |                  |
|         |         | Total Static Pressure : 20 mm Wg                    |     |      |          |           |                  |                  |
|         |         | Fan Speed : 1450 RPM                                |     |      |          |           |                  |                  |
|         |         | Fan motor : 3.8 kW approx.                          |     |      |          |           |                  |                  |
|         |         | Fan dia : 630 mm approx.                            |     |      |          |           |                  |                  |
|         |         | Noise level : not exceeding 75 db at 3.0m from fan. |     |      |          |           |                  |                  |
|         |         | Fan duty : Smoke Fresh air                          |     |      |          |           |                  |                  |
|         |         | Fan as described above.                             | 1   | Nos. |          | 92,963.00 | -                | 92,963.00        |
| 18.8.31 | NSR     | Smoke Venting - Second floor-1,2&3                  |     |      |          |           |                  |                  |
|         |         | Air Qty : 2200 CFM                                  |     |      |          |           |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Total Static Pressure : 20 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 2850 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 1.1 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 630 mm approx.   |     |      |          |            |                  |                  |
|        |         | Noise level : not exceeding 75 db at 3.0m from fan.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Smoke Fresh air   |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 3   | Nos. |          | 41,625.00  | -                | 124,875.00       |
| 18.9   | NSR     | TUBE AXIAL FLOW FANS FOR PRESSURIZATION  |     |      |          |            |                  |                  |
|        |         | Supply, installation, testing & commissioning of Tube Axial Fan with impeller having adjustable pitch angle blades and complete with suitable motor & drive assembly. Motor shall also be suitable for fixed Speed drive & shall be high efficiency Class IE3. Motor shall be suitable for 415 ± 10% V, 3 Phase, 4 Wire, 50 ± 3%Hz electrical supply. Fans shall be AMCA certified (AMCA 210 for air performance & AMCA 300 for sound). The price shall include all accessories & all necessary vibration isolation system, flexible canvass connections, mounting frames, hangers, supports, nut & bolts etc. Fans shall be AMCA certified. |     |      |          |            |                  |                  |
| 18.9.1 | NSR     | Staircase-1 Press.   |     |      |          |            |                  |                  |
|        |         | Air Qty : 16700 CFM  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 900 mm approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Pressurization  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 185,921.00 | -                | 185,921.00       |
| 18.9.2 | NSR     | Staircase-2,3,4 Press.   |     |      |          |            |                  |                  |
|        |         | Air Qty : 18000 CFM  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 1000 mm approx.  |     |      |          |            |                  |                  |
|        |         | Fan duty : Pressurization  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 3   | Nos. |          | 200,393.00 | -                | 601,179.00       |
| 18.9.3 | NSR     | Staircase-5 Press.   |     |      |          |            |                  |                  |
|        |         | Air Qty : 15800 CFM  |     |      |          |            |                  |                  |
|        |         | Total Static Pressure : 30 mm Wg   |     |      |          |            |                  |                  |
|        |         | Fan Speed : 1450 RPM   |     |      |          |            |                  |                  |
|        |         | Fan motor : 7.5 kW approx.   |     |      |          |            |                  |                  |
|        |         | Fan dia : 900 mm approx.   |     |      |          |            |                  |                  |
|        |         | Fan duty : Pressurization  |     |      |          |            |                  |                  |
|        |         | Fan as described above.  | 1   | Nos. |          | 175,901.00 | -                | 175,901.00       |

| S No.  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 18.9.4 | NSR     | Lift Lobby Press.<br>Air Qty : 11000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 710 mm approx.<br>Fan duty : Pressurization<br>Fan as described above.                          | 10  | Nos. |          | 124,689.00 | -                | 1,246,890.00     |
| 18.9.5 | NSR     | Liftwell Press.<br>Air Qty : 6500 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 2.2 kW approx.<br>Fan dia : 630 mm approx.<br>Fan duty : Pressurization<br>Fan as described above.                             | 6   | Nos. |          | 90,188.00  | -                | 541,128.00       |
| 18.9.6 | NSR     | Lift Well Press.<br>Air Qty : 10500 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 710 mm approx.<br>Fan duty : Pressurization<br>Fan as described above.                           | 4   | Nos. |          | 116,896.00 | -                | 467,584.00       |
| 18.9.7 | NSR     | FOR ACADEMIC BLOCK<br>Staircase-1&2 Press.<br>Air Qty : 15000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 7.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 166,994.00 | -                | 333,988.00       |
| 18.9.8 | NSR     | Liftwell Press.<br>Air Qty : 14000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above.                            | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |

| S No.   | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|---------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1       | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 18.9.9  | NSR     | Liftwell Press.<br>Air Qty : 13000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 7.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |
| 18.9.10 | NSR     | Liftwell Press.<br>Air Qty : 14000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |
| 18.9.11 | NSR     | Liftwell Press.<br>Air Qty : 14000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |
| 18.9.12 | NSR     | Liftwell Press.<br>Air Qty : 13000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |
| 18.9.13 | NSR     | Liftwell Press.<br>Air Qty : 13000 CFM<br>Total Static Pressure : 30 mm Wg<br>Fan Speed : 1450 RPM<br>Fan motor : 5.5 kW approx.<br>Fan dia : 900 mm approx.<br>Fan duty : Pressurization<br>Fan as described above. | 2   | Nos. |          | 155,862.00 | -                | 311,724.00       |
| 18.9.14 | NSR     | Liftwell Press. (For Dharamshala)  |     |      |          |            |                  |                  |

| S No.        | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1            | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|              |         | Air Qty : 8500 CFM  |     |      |          |            |                  |                  |
|              |         | Total Static Pressure : 30 mm Wg  |     |      |          |            |                  |                  |
|              |         | Fan Speed : 1450 RPM  |     |      |          |            |                  |                  |
|              |         | Fan motor : 3.75 kW approx.   |     |      |          |            |                  |                  |
|              |         | Fan dia : 710 mm approx.  |     |      |          |            |                  |                  |
|              |         | Fan duty : Pressurization   |     |      |          |            |                  |                  |
|              |         | Fan as described above.   | 3   | Nos. |          | 94,630.00  | -                | 283,890.00       |
|              |         | Note:   |     |      |          |            |                  |                  |
|              |         | Fan to have safety wire mesh screen on any exposed face.  |     |      |          |            |                  |                  |
| <b>11.00</b> |         | <b>VRF UNITS</b>  |     |      |          |            |                  |                  |
| 11.1         | NSR     | Supply, Installation, testing and commissioning of Indoor units as specified in datasheet "VRF-IDU" and as shown on drawings inclusive of the accessories as specified below:   |     |      |          |            |                  |                  |
|              |         | (a) Power cabling from nearest socket outlet to the indoor unit   |     |      |          |            |                  |                  |
|              |         | (b) Approved Model Room thermostat with time scheduling, controlling function for IDU and wiring in HMS conduit between thermostat.   |     |      |          |            |                  |                  |
|              |         | (c) Supporting GI frame & brackets for Wall mounting  |     |      |          |            |                  |                  |
| 11.1.1       | NSR     | Supply, Installation, Testing & Commissioning of High Wall mounted Indoor Units 1.5TR 892 cmh.  | 10  | Nos. |          | 31,931.00  |                  | 319,310.00       |
| 11.1.2       | NSR     | Supply, Installation, Testing & Commissioning of High Wall mounted Indoor Units 2.0TR 1190 cmh.   | 10  | Nos. |          | 33,066.00  |                  | 330,660.00       |
| 11.1.3       | NSR     | Supply, installation, testing & commissioning of Ceiling Suspended Indoor Unit 8TR 5780 cmh as per data sheet VRF-CSU.  | 5   | Nos. |          | 106,160.00 |                  | 530,800.00       |
| 11.2         | NSR     | Supply, installation, testing & commissioning of <b>VRF OUTDOOR</b> Units as specified in datasheet "VRF-ODU" meeting ASHRAE Standard 90.1.2010 and shown in the drawing, consisting of:<br>Ambient Dry bulb temperature = 38 ± 2 degree C<br>Refrigerant R407c / R410a<br>Minimum COP 3.5, IKW / TR equal to and less than 1.0 |     |      |          |            |                  |                  |
|              |         | i) Supply & Charging of refrigerant inclusive of all necessary safety arrangements, loading & unloading of material as instructed by project manager at site  |     |      |          |            |                  |                  |
|              |         | ii) Vibration mounts & Flexible isolators   |     |      |          |            |                  |                  |

| S No.               | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items      |
|---------------------|---------|--|-----|------|----------|------------|------------------|-----------------------|
| 1                   | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                     |
|                     |         | iii) MS Stand structure for ODUs   |     |      |          |            |                  |                       |
|                     |         | iv) Thermostatic control & control wires from the control unit to IDUs & ODUs  |     |      |          |            |                  |                       |
|                     |         | v) connections of the gas and liquid lines   |     |      |          |            |                  |                       |
|                     |         | vi) Microprocessor Based Control Panel Bacnet compatible protocol to integrate operation with 3rd party Building Management System.  |     |      |          |            |                  |                       |
|                     |         | vii) MCB+ELCB of suitable rating and Power cabling/ wiring from MCB/MCCB/ELCB to the Outdoor unit  |     |      |          |            |                  |                       |
|                     |         | viii) 2# Earthing strip/wire from outdoor unit to grid in shaft  |     |      |          |            |                  |                       |
|                     |         | ix) Customs clearance  |     |      |          |            |                  |                       |
|                     |         | x) Loading, unloading In - land transport, insurance   |     |      |          |            |                  |                       |
|                     |         | xi) Octroi   |     |      |          |            |                  |                       |
|                     |         | xii) Erection on foundation & assistance in testing and commissioning  |     |      |          |            |                  |                       |
|                     |         | xiii) Intelligent central control and monitoring panel with touch panel for floor consist of Direct Digital Controller, Software for automation of entire plant for that floor Hardwiring between controller & equipment Protocol integrator for interface with 3rd Party BMS or BACNET / LON. |     |      |          |            |                  |                       |
|                     |         |  |     |      |          |            |                  |                       |
| 11.2.1              | NSR     | Supply, Installation, Testing & Commissioning of Outdoor Units ODU_6-HP  | 3   | Nos. |          | 144,371.00 |                  | 433,113.00            |
| 11.2.2              | NSR     | Supply, Installation, Testing & Commissioning of Outdoor Units _ODU_8-HP   | 3   | Nos. |          | 157,235.00 |                  | 471,705.00            |
| 11.2.3              | NSR     | Supply, Installation, Testing & Commissioning of Outdoor Units ODU 12-HP   | 3   | Nos. |          | 218,600.00 |                  | 655,800.00            |
| 11.2.4              | NSR     | Supply, Installation, Testing & Commissioning of Outdoor Units ODU 24-HP   | 2   | Nos. |          | 441,967.00 |                  | 883,934.00            |
|                     |         | <b>TOTAL CARRIED TO SUMMARY</b>  |     |      |          |            | -                | <b>260,966,796.00</b> |
| <b>SUB HEAD '2'</b> |         | <b>PLUMBING</b>  |     |      |          |            |                  |                       |
| 1                   | 16.1    | INSULATED CHILLED/HOT WATER PIPING (Resin bonded fiber glass insulation)   |     |      |          |            |                  |                       |

| S No. | Code No | Item Description  | Qty   | Unit  | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|-------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2   | 3     | 4     | 5        | 6         | 6                | 8                |
|       |         | Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/m3 density resin bonded fiber glass or 144 kg/m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sqm polythene sheet (vapour barrier) & finally applying 0.63 mm aluminium sheet cladding complete with type 3 grade 1 roofing felt strip (as per IS:1322as ammended upto date ) at joints and repairing of damage to building etc. as per specification and as required.Note:The pieces of size 150 mm & below shall be MS C class as per IS: 1239 and pipes size above 150 mm shall be welded black steel pipe hevy class as per IS : 3589 from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia. and from from minimum 7 mm thick MS sheet for pipes of 400 mm dia and above. |       |       |          |           |                  |                  |
|       |         | Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.   |       |       |          |           |                  |                  |
| 1.1   | NSR     | 750 mm dia (100 mm thick insulation )   | 10    | Meter |          | 22,657.00 | -                | 226,570.00       |
| 1.2   | NSR     | 600 mm dia (100 mm thick insulation )   | 148   | Meter |          | 18,512.00 | -                | 2,739,776.00     |
| 1.3   | NSR     | 500 mm dia (100 mm thick insulation )   | 270   | Meter |          | 15,331.00 | -                | 4,139,370.00     |
| 1.4   | 16.1.1  | 400 mm dia. (75 mm thick insulation)  | 108   | Meter | 10,309   |           | 1,113,372.00     | -                |
| 1.5   | 16.1.2  | 350 mm dia. (75 mm thick insulation)  | 162   | Meter | 7,120    |           | 1,153,440.00     | -                |
| 1.6   | 16.1.3  | 300 mm dia. (75 mm thick insulation)  | 194   | Meter | 6,354    |           | 1,232,676.00     | -                |
| 1.7   | 16.1.4  | 250 mm dia. (75 mm thick insulation)  | 76    | Meter | 5,368    |           | 407,968.00       | -                |
| 1.8   | 16.1.5  | 200 mm dia. (75 mm thick insulation)  | 810   | Meter | 4,479    |           | 3,627,990.00     | -                |
| 1.9   | 16.1.6  | 150 mm dia. (50 mm thick insulation)  | 459   | Meter | 2,939    |           | 1,349,001.00     | -                |
| 1.10  | 16.1.7  | 125 mm dia. (50 mm thick insulation)  | 1,071 | Meter | 2,499    |           | 2,676,429.00     | -                |
| 1.11  | 16.1.8  | 100 mm dia. (50 mm thick insulation)  | 1,255 | Meter | 2,167    |           | 2,719,585.00     | -                |
| 1.12  | 16.1.9  | 80 mm dia. (50 mm thick insulation)   | 1,278 | Meter | 1,637    |           | 2,092,086.00     | -                |
| 1.13  | 16.1.10 | 65 mm dia. (50 mm thick insulation)   | 2,457 | Meter | 1,412    |           | 3,468,578.00     | -                |
| 1.14  | 16.1.11 | 50 mm dia. (50 mm thick insulation)   | 1,233 | Meter | 1,163    |           | 1,433,979.00     | -                |
| 1.15  | 16.1.12 | 40 mm dia. (50 mm thick insulation)   | 2,060 | Meter | 986      |           | 2,031,160.00     | -                |
| 1.16  | 16.1.13 | 32 mm dia. (50 mm thick insulation)   | 1,660 | Meter | 869      |           | 1,442,540.00     | -                |
| 1.17  | 16.1.14 | 25 mm dia. (50 mm thick insulation)   | 1,615 | Meter | 777      |           | 1,254,855.00     | -                |
| 2     | NSR     | INSULATED PIPING (BURRIED/LAID IN GROUND/EARTH)   |       |       |          |           |                  |                  |



| S No.    | Code No  | Item Description  | Qty   | Unit  | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|----------|----------|---|-------|-------|----------|-----------|------------------|------------------|
| 1        | 1A       | 2   | 3     | 4     | 5        | 6         | 6                | 8                |
|          |          | Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping plumbing inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with Cement sand plaster and tarpoline sheet for external protection pipe section of density 20 kg/cu.m after a thick coat of cold setting adhesive CPRX compound) wrapping with 500g polythene faced hessain complete with type3, grade 1 roofing feltstrip(as per IS:1322 as amended up to date) at joints repairing of damage to building etc. as per specifications and as required complete in all respect. |       |       |          |           |                  |                  |
|          |          | Note:-The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.  |       |       |          |           |                  |                  |
| 2.1      | NSR      | 500 mm dia. (75 mm thick insulation)  | 625   | Meter |          | 15,471.00 | -                | 9,669,375.00     |
| 2.2      | 16.3.1   | 300 mm dia. (75 mm thick insulation)  | 297   | Meter | 4,923    |           | 1,462,131.00     | -                |
| 2.3      | 16.3.3   | 200 mm dia. (75 mm thick insulation)  | 1,337 | Meter | 2,779    |           | 3,714,133.50     | -                |
| 2.4      | 16.3.4   | 150 mm dia. (75 mm thick insulation)  | 297   | Meter | 2,330    |           | 692,010.00       | -                |
| 2.5      | 16.3.5   | 125 mm dia. (50 mm thick insulation)  | 747   | Meter | 1,981    |           | 1,479,807.00     | -                |
| 2.6      | 16.3.6   | 100 mm dia. (50 mm thick insulation)  | 133   | Meter | 1,555    |           | 206,815.00       | -                |
| 2.7      | 16.3.7   | 80 mm dia. (50 mm thick insulation)   | 76    | Meter | 1,343    |           | 102,068.00       | -                |
| 2.8      | 16.3.8   | 65 mm dia. (50 mm thick insulation)   | 32    | Meter | 944      |           | 30,208.00        | -                |
|          |          |   |       |       |          |           |                  |                  |
| <b>3</b> |          | <b>CHILLED/HOT WATER INSULATED VALVES</b>   |       |       |          |           |                  |                  |
|          |          |   |       |       |          |           |                  |                  |
| 3.1      | 16.7     | Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications.   |       |       |          |           |                  |                  |
|          | 16.7.1   | BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/ hot water circulation including insulation (CFC/HCFC-free) as specified.   |       |       |          |           |                  |                  |
| 3.1.1    | NSR      | 500mm NB  | 2     | Nos.  |          | 67,725.00 | -                | 135,450.00       |
| 3.1.2    | NSR      | 450mm NB  | 2     | Nos.  |          | 62,725.00 | -                | 125,450.00       |
| 3.1.3    | NSR      | 400mm NB  | 2     | Nos.  |          | 55,223.00 | -                | 110,446.00       |
| 3.1.4    | NSR      | 350mm NB  | 2     | Nos.  |          | 41,970.00 | -                | 83,940.00        |
| 3.1.5    | NSR      | 300mm NB  | 27    | Nos.  |          | 29,513.00 | -                | 796,851.00       |
| 3.1.6    | NSR      | 250mm NB  | 2     | Nos.  |          | 21,562.00 | -                | 43,124.00        |
| 3.1.7    | 16.7.1.1 | 200mm NB  | 20    | Nos.  | 11,102   |           | 222,040.00       | -                |
| 3.1.8    | 16.7.1.2 | 150mm NB  | 2     | Nos.  | 6,625    |           | 13,250.00        | -                |
| 3.1.9    | 16.7.1.3 | 125mm NB  | 8     | Nos.  | 5,780    |           | 46,240.00        | -                |
| 3.1.10   | 16.7.1.4 | 100mm NB  | 29    | Nos.  | 5,330    |           | 154,570.00       | -                |
| 3.1.11   | 16.7.1.5 | 80mm NB   | 44    | Nos.  | 3,719    |           | 163,636.00       | -                |
| 3.1.12   | 16.7.1.6 | 65mm NB   | 222   | Nos.  | 3,351    |           | 743,922.00       | -                |

| S No.  | Code No  | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|----------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A       | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
| 3.1.13 | 16.7.1.7 | 50mm NB   | 78  | Nos. | 3,050    |            | 237,900.00       | -                |
| 3.1.14 | 16.7.1.8 | 40mm NB   | 108 | Nos. | 2,686    |            | 290,088.00       | -                |
| 3.2    | NSR      | Supply, installation, testing & commissioning of Motorised Butterfly valves (Zero leak) complete with (Push Buttons for ON/OFF arrangement & ON /OFF valve indications) companion flanges, nuts, bolts, gaskets etc. as specified. Butterfly valves with cast iron body, seat of black nitrile rubber (tight shut-off), nylon coated S.G. iron disc, PTFE coated SS (AISI 410) shaft. These valves shall conform to BS: 5155, MSS SP 67 & API 609. The valves shall be suitable for flow in either direction and seal in both directions. The valves shall be of integral moulded design. Actuator shall have potential free contacts for status monitoring. The price shall include necessary control wiring etc. The valve actuator shall be compatible with BMS operation / Control through chiller plant manager. Valve shall be complete with step down transformer and wiring and conduiting upto the valve. Power shall be provided by the electrical contractor near each valve at a distance of maximum 5 meter. |     |      |          |            |                  |                  |
| 3.2.1  | NSR      | 300mm NB  | 5   | Nos. |          | 87,013.00  | -                | 435,065.00       |
| 3.2.2  | NSR      | 200mm NB  | 2   | Nos. |          | 61,922.00  | -                | 123,844.00       |
| 3.2.3  | NSR      | 100mm NB  | 3   | Nos. |          | 39,801.00  | -                | 119,403.00       |
| 3.3    | 16.7.3   | NON - RETURN VALVE with duel plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation (CFC/HCFC-free) as specified.   |     |      |          |            |                  |                  |
| 3.3.1  | NSR      | 300mm NB  | 9   | Nos. |          | 31,932.00  | -                | 287,388.00       |
| 3.3.2  | 16.7.3.1 | 200mm NB  | 7   | Nos. | 9,655    |            | 67,585.00        | -                |
| 3.3.3  | 16.7.3.4 | 100mm NB  | 4   | Nos. | 3,893    |            | 15,572.00        | -                |
| 3.4    | NSR      | Automatic Balancing Valves  |     |      |          |            |                  |                  |
|        |          | Supply, installation, testing & commissioning of Automatic Balancing valves having forged brass / gray iron / ductile iron body with pressure rating as per specification, stainless steel stem & sealing disc. Flow regulation cartridge shall be precision ground AISI type 300 Series stainless steel, in multiple KpaD control ranges, minimum range shall be capable of being activated by 10 KpaD, and shall be capable of controlling flow within $\pm 5\%$ of rated flow. The valve shall be complete with companion flanges, nuts, bolts, gaskets and probes for pressure measurement complete with pressure readout points etc. The settings of the auto balancing should be demonstrated at site with proper documentation of the parameters including insulation (CFC/HCFC-free) as specified.  |     |      |          |            |                  |                  |
| 3.4.1  | NSR      | 300mm NB  | 5   | Nos. |          | 346,259.00 |                  | 1,731,295.00     |
| 3.5    |          | Manual Balancing Valve  |     |      |          |            |                  |                  |

| S No. | Code No  | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|----------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A       | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       | 16.7.2   | BALANCING VALVE WITH BUILT IN MEASURING FACILITY with C I body flanged construction with EPDM coated disc with long pitch with protected out pipe insulation (CFC/HCFC-free) & PN 16 pressure rating for chilled / hot water circulation as specified.  |     |      |          |            |                  |                  |
| 3.5.1 | NSR      | 400mm NB  | 1   | Nos. |          | 242,468.00 | -                | 242,468.00       |
| 3.5.2 | NSR      | 300mm NB  | 1   | Nos. |          | 179,074.00 | -                | 179,074.00       |
| 3.5.3 | 16.7.2.1 | 200mm NB  | 4   | Nos. | 48,763   |            | 195,052.00       |                  |
| 3.5.4 | 16.7.2.2 | 150mm NB  | 3   | Nos. | 23,798   |            | 71,394.00        |                  |
| 3.5.5 | 16.7.2.3 | 125mm NB  | 15  | Nos. | 18,608   |            | 279,120.00       |                  |
| 3.5.6 | 16.7.2.4 | 100mm NB  | 4   | Nos. | 11,945   |            | 47,780.00        |                  |
| 3.5.7 | 16.7.2.5 | 80mm NB   | 1   | Nos. | 7,395    |            | 7,395.00         |                  |
| 3.5.8 | 16.7.2.6 | 65mm NB   | 1   | Nos. | 7,101    |            | 7,101.00         |                  |
|       |          |   |     |      |          |            |                  |                  |
| 3.6   | 16.7.4   | Y - STRAINER of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation including insulation (CFC/HCFC-free) as specified.   |     |      |          |            |                  |                  |
| 3.6.1 | NSR      | 300mm NB  | 9   | Nos. |          | 37,604.00  | -                | 338,436.00       |
| 3.6.2 | 16.7.4.1 | 200mm NB  | 7   | Nos. | 20,853   |            | 145,971.00       | -                |
| 3.6.3 | 16.7.4.4 | 100mm NB  | 5   | Nos. | 6,918    |            | 34,590.00        | -                |
| 3.6.4 | 16.7.4.5 | 80mm NB   | 18  | Nos. | 5,026    |            | 90,468.00        | -                |
| 3.6.5 | 16.7.4.6 | 65mm NB   | 110 | Nos. | 4,434    |            | 487,740.00       | -                |
| 3.6.6 | 16.7.4.7 | 50mm NB   | 39  | Nos. | 3,516    |            | 137,124.00       | -                |
| 3.6.7 | 16.7.4.8 | 40mm NB   | 53  | Nos. | 2,478    |            | 131,334.00       | -                |
|       |          |   |     |      |          |            |                  |                  |
| 3.7   | NSR      | Supply, installation, testing & commissioning of electronic, Self-balancing, Pressure independent type dynamic balancing Valve with integrated 2 way modulating Control valves in a single body for AHU's. The actuator shall be capable of accepting 2-10VDC, 4- 20 mA electric signal and shall provide similar transduced feedback output signal to control system. The minimum close off Pressure of actuator must be 1.5 times shut off head of pump as per specifications of following sizes. The settings of the auto balancing should be demonstrated at site with proper documentation of the parameters. The actuators shall be micro processor based with a self calibrating feature. Valves shall be BMS compatible / valves shall be complete with thermostat, control wiring & probe. |     |      |          |            |                  |                  |
| 3.7.1 | NSR      | 25/32/40mm (upto 37 GPM Flow rate)  | 163 | Nos. |          | 23,920.00  | -                | 3,898,960.00     |
| 3.7.2 | NSR      | 50/65/80mm (upto 113 GPM Flow rate)   | 156 | Nos. |          | 70,666.00  | -                | 11,023,896.00    |
| 3.7.3 | NSR      | 80/100mm (upto 149 GPM Flow rate)   | 16  | Nos. |          | 104,626.00 | -                | 1,674,016.00     |
|       |          |   |     |      |          |            |                  |                  |
| 3.8   | NSR      | Supply, installation, testing and commissioning of insulated neoprene rubber expansion belows with integral reinforced rubber flanges at chiller & chilled water pumps (inlet & outlet) and as per specifications:  |     |      |          |            |                  |                  |
| 3.8.1 | NSR      | 300mm NB  | 28  | Nos. |          | 20,762.00  | -                | 581,336.00       |
| 3.8.2 | NSR      | 200mm NB  | 18  | Nos. |          | 12,017.00  | -                | 216,306.00       |

| S No.  | Code No | Item Description   | Qty | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|-------|----------|----------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4     | 5        | 6        | 6                | 8                |
| 3.8.3  | NSR     | 100mm NB   | 14  | Nos.  |          | 6,775.00 | -                | 94,850.00        |
| 3.9    | NSR     | Supply, installation, testing & commissioning of ball valves complete with bronze forged body, chrome plated bronze ball and control lever etc.  |     |       |          |          |                  |                  |
| 3.9.1  | NSR     | 32mm NB  | 83  | Nos.  |          | 1,628.00 | -                | 135,124.00       |
| 3.9.2  | NSR     | 25mm NB  | 178 | Nos.  |          | 984.00   | -                | 175,152.00       |
| 3.10   | NSR     | Supply, installation, testing & commissioning of ball valves with strainer complete with bronze forged body, chrome plated bronze ball and control lever etc.  |     |       |          |          |                  |                  |
| 3.10.1 | NSR     | 32mm NB  | 83  | Nos.  |          | 3,834.00 | -                | 318,222.00       |
| 3.10.2 | NSR     | 25mm NB  | 178 | Nos.  |          | 2,832.00 | -                | 504,096.00       |
| 4      | NSR     | Supplying, fixing, testing and commissioning of G.I water pipes on wall of following size along with necessary clamps, fittings such as bends, tees etc. adequately supported as per specifications and as required. |     |       |          |          |                  |                  |
|        |         | Drain pipes shall be insulated with 9 mm thick Nitrile Rubber (In shafts / on terrace / outdoors / buried in ground in trenches).  |     |       |          |          |                  |                  |
| 4.1    | NSR     | 25mm dia G.I pipe medium class (For drainage of water from AHU's).   | 825 | Meter |          | 414.00   | -                | 341,550.00       |
| 4.2    | NSR     | 32mm dia G.I pipe medium class (For drainage of water from AHU's).   | 445 | Meter |          | 493.00   | -                | 219,385.00       |
| 5      | 16.8    | Providing and fixing in position the industrial type pressure gauges with gun metal / brass valves complete as required  | 576 | Nos.  | 973      |          | 560,448.00       | -                |
| 6      | 16.9    | Providing & fixing in position the mercury in glass industrial type thermometres.  | 560 | Nos.  | 707      |          | 395,920.00       | -                |
| 7      | NSR     | Supply, installation, testing & commissioning of Chilled Water Line Flow Switch.   | 14  | Nos.  |          | 2,300.00 | -                | 32,200.00        |
| 8      | NSR     | Supply, installation, testing and commissioning of Automatic Air vents - 25mm dia.   | 54  | Nos.  |          | 2,153.00 | -                | 116,262.00       |
| 9      | NSR     | Pressurization Unit with built in degassing and automatic make up water  |     |       |          |          |                  |                  |

| S No.  | Code No | Item Description  | Qty | Unit  | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|-------|----------|--------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4     | 5        | 6            | 6                | 8                |
|        |         | Supply, Installation and Testing of Pressurization Unit with built in degassing and automatic make up water, two pump system including one standby, pressure switch, non-return valve, pressure gauges and necessary isolating valves. Expansion Tanks shall be at atmospheric pressure and capable of doing microbubble separator and degassing air in the system. Tank shall be of MS/black steel construction as per the specifications. Expansion tanks shall be of following capacities: |     |       |          |              |                  | -                |
| 9.1    | NSR     | 8000 Liters   | 1   | Nos.  |          | 1,277,170.00 | -                | 1,277,170.00     |
| 9.2    | NSR     | 3000 Liters   | 1   | Nos.  |          | 870,324.00   | -                | 870,324.00       |
| 9.3    | NSR     | 2000 Liters   | 1   | Nos.  |          | 779,435.00   | -                | 779,435.00       |
| 10     | NSR     | <b>DIRT SEPARATORS</b>  |     |       |          |              |                  |                  |
|        |         | Supply, Installation, Testing & Commissioning of Dirt Separators as per the specifications on the return water line located at the pump suction or a suitable location as suggested and suitable for water flow mentioned below. The separator should be complete with air vent, service valve, flanges, drain valve etc. The separator should be capable of removing dirt particles upto 5 micron size   |     |       |          |              |                  |                  |
| 10.1   | NSR     | 9600 USGPM  | 1   | Nos.  |          | 559,917.00   | -                | 559,917.00       |
| 10.2   | NSR     | 1080 USGPM  | 1   | Nos.  |          | 82,072.00    | -                | 82,072.00        |
| 10.3   | NSR     | 350 USGPM   | 1   | Nos.  |          | 55,238.00    | -                | 55,238.00        |
| Notes: |         | All valves and fittings/ fixtures shall be suitable for PN 16 rating.   |     |       |          |              |                  |                  |
|        |         | All motorized valves (butterfly, two way and ball valves) actuators shall be "BMS" compatible (should have potential free contacts).  |     |       |          |              |                  |                  |
|        |         | <b>CONDENSER WATER PIPE</b>   |     |       |          |              |                  |                  |
| 11     | NSR     | Supplying, fixing, testing and commissioning of condenser water pipes of following sizes of MS 'C' class along with necessary clamps, vibration isolators and fittings such as bends,tees etc..but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specification and as required complete in all respect.  |     |       |          |              |                  |                  |
|        |         | Note:-The Pipes size 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.  |     |       |          |              |                  |                  |
|        |         | For Condenser Water System - MS 'C' Heavy class pipe  |     |       |          |              |                  |                  |
| 11.1   | NSR     | 700mm dia   | 296 | Meter |          | 15,569.00    | -                | 4,608,424.00     |
| 11.1   | NSR     | 400mm dia   | 139 | Meter |          | 8,155.00     | -                | 1,133,545.00     |

| S No. | Code No   | Item Description   | Qty | Unit  | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|-----------|--|-----|-------|----------|------------|------------------|------------------|
| 1     | 1A        | 2  | 3   | 4     | 5        | 6          | 6                | 8                |
| 11.1  | 16.10.1   | 300mm dia  | 9   | Meter | 4,187    |            | 37,683.00        | -                |
| 11.1  | 16.10.2   | 250mm dia  | 386 | Meter | 3,524    |            | 1,360,264.00     | -                |
| 11.1  | 16.10.3   | 200mm dia  | 6   | Meter | 2,918    |            | 17,508.00        | -                |
| 11.1  | 16.10.4   | 150mm dia  | 6   | Meter | 1,983    |            | 11,898.00        | -                |
| 11.1  | 16.10.5   | 125mm dia  | 6   | Meter | 1,710    |            | 10,260.00        | -                |
| 11.1  | 16.10.6   | 100mm dia  | 6   | Meter | 1,436    |            | 8,616.00         | -                |
| 11.1  | NSR       | 80mm dia   | 6   | Meter |          | 1,077.00   | -                | 6,462.00         |
| 11.1  | NSR       | 65mm dia   | 6   | Meter |          | 865.00     | -                | 5,190.00         |
| 11.1  | NSR       | 50mm dia   | 6   | Meter |          | 628.00     | -                | 3,768.00         |
| 11.1  | NSR       | 40mm dia   | 6   | Meter |          | 457.00     | -                | 2,742.00         |
| 12    |           | VALVES WITHOUT insulation  |     |       |          |            |                  |                  |
|       | 16.11     | Supplying, fixing, testing and commissioning of following valves, gauges and strainers for condenser water circulation as per specifications.  |     |       |          |            |                  |                  |
|       | 16.11.1   | BUTTERFLY VALVE (MANUAL) with CI body SS disc nitrile sheet & O - ring & PN 16 pressure rating as specified.   |     |       |          |            |                  |                  |
| 12.1  | NSR       | 700mm dia  | 3   | Meter |          | 81,617.00  | -                | 244,851.00       |
| 12.2  | NSR       | 400mm NB   | 23  | Nos.  |          | 51,766.00  | -                | 1,190,618.00     |
| 12.3  | NSR       | 250mm NB   | 14  | Nos.  |          | 18,352.00  | -                | 256,928.00       |
| 13    | 16.11.3   | Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. |     |       |          |            |                  |                  |
| 13.1  | NSR       | 400mm NB   | 15  | Nos.  |          | 154,635.00 | -                | 2,319,525.00     |
| 13.2  | 16.11.3.3 | 250mm NB   | 6   | Nos.  | 53,014   | 69,571.00  | 318,084.00       | 417,426.00       |
| 14    | 16.11.2   | NON - RETURN VALVE with dual plate of CI body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating as specified.  |     |       |          |            |                  |                  |
| 14.1  | NSR       | 400mm NB   | 5   | Nos.  |          | 73,283.00  | -                | 366,415.00       |
| 14.2  | NSR       | 250mm NB   | 2   | Nos.  |          | 21,963.00  | -                | 43,926.00        |
| 15    |           | Manual Balancing Valve   |     |       |          |            |                  |                  |
|       | NSR       | BALANCING VALVE WITH BUILT IN MEASURING FACILITY with C I body flanged construction with EPDM coated disc with long pitch & PN 16 pressure rating as specified.  |     |       |          |            |                  |                  |
| 15.1  | NSR       | 400mm NB   | 10  | Nos.  |          | 274,279.00 | -                | 2,742,790.00     |
| 15.2  | NSR       | 250mm NB   | 4   | Nos.  |          | 94,799.00  | -                | 379,196.00       |
| 16    | NSR       | Supply, installation, testing & commissioning of MS fabricated "Y" type strainers with removable type bronze screen with 3mm perforation & permanent magnet etc.   |     |       |          |            |                  |                  |

| S No.  | Code No | Item Description  | Qty | Unit  | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|-------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4     | 5        | 6          | 6                | 8                |
| 16.1   | NSR     | 400mm NB  | 5   | Nos.  |          | 59,263.00  | -                | 296,315.00       |
| 16.2   | NSR     | 250mm NB  | 2   | Nos.  |          | 25,191.00  | -                | 50,382.00        |
| 17     | NSR     | Supply, installation, testing and commissioning of neoprene rubber expansion belows with integral reinforced rubber flanges at chiller & condenser water pumps (inlet & outlet) and as per specifications:  |     |       |          |            |                  |                  |
| 17.1   | NSR     | 400mm NB  | 20  | Nos.  |          | 29,528.00  | -                | 590,560.00       |
| 17.2   | NSR     | 250mm NB  | 8   | Nos.  |          | 21,975.00  | -                | 175,800.00       |
| 18     | NSR     | Supply, installation, testing & commissioning of Condenser Water Line Flow Switch.  | 6   | Nos.  |          | 2,070.00   | -                | 12,420.00        |
| 19     | NSR     | Supply, installation, testing and commissioning of pot strainer CI/MS body cover flanged ends, basket of brass/bronze/SS wire mesh 24 G x14 mesh for condenser water application complete with flanges, nuts, bolts, gaskets as specified and required.   |     |       |          |            |                  |                  |
| 19.1   | NSR     | 700mm NB  | 1   | Nos.  |          | 425,000.00 | -                | 425,000.00       |
| 19.2   | NSR     | 250mm NB  | 1   | Nos.  |          | 68,000.00  | -                | 68,000.00        |
| 20     | 16.8    | Providing and fixing in position the industrial type pressure gauge with gun metal / brass valves complete as required.   | 28  | Nos.  | 973      |            | 27,244.00        | -                |
| 21     | 16.9    | Providing & fixing in position the mercury in glass industrial type thermometer complete as required.   | 14  | Nos.  | 707      |            | 9,898.00         | -                |
| Notes: |         | All valves and fittings/ fixtures shall be suitable for PN 16 rating.<br>All motorized valves (butterfly, three / two way and ball valves) actuators shall be "BMS" compatible (should have potential free contacts).   |     |       |          |            |                  |                  |
| 22     |         | REFRIGERATION PIPING FOR VRF  |     |       |          |            |                  |                  |
| 22.1   | NSR     | Supply, Installation, Testing & commissioning of Refrigeration piping from Outdoor unit to to various indoor units including insulation with fitting (refnet etc.) , solenoid Refrigerant ODU to IDU & support in GI tray & inuslation with joints,control cabling from 19mm thick Class 'O' closed cell Nitrile rubber insulation with factory laminated glass cloth |     |       |          |            |                  |                  |
| 22.1.1 | NSR     | 6.4mm dia   | 220 | Meter |          | 460.00     |                  | 101,200.00       |
| 22.1.2 | NSR     | 9.5mm dia   | 300 | Meter |          | 522.00     |                  | 156,600.00       |
| 22.1.3 | NSR     | 12.7mm dia  | 150 | Meter |          | 502.00     |                  | 75,300.00        |
| 22.1.4 | NSR     | 15.9mm dia  | 100 | Meter |          | 687.00     |                  | 68,700.00        |
| 22.1.5 | NSR     | 19.1mm dia  | 126 | Meter |          | 837.00     |                  | 105,462.00       |
| 22.1.6 | NSR     | 22.2mm dia  | 112 | Meter |          | 996.00     |                  | 111,552.00       |
| 22.1.7 | NSR     | 28.6mm dia  | 95  | Meter |          | 1,180.00   |                  | 112,100.00       |

| S No.               | Code No   | Item Description   | Qty    | Unit  | DSR Rate | NSR Rate | Amount DSR Items     | Amount NSR Items     |
|---------------------|-----------|--|--------|-------|----------|----------|----------------------|----------------------|
| 1                   | 1A        | 2  | 3      | 4     | 5        | 6        | 6                    | 8                    |
| 22.1.8              | NSR       | 34.9mm dia   | 36     | Meter |          | 1,426.00 |                      | 51,336.00            |
|                     |           |  |        |       |          |          |                      | -                    |
| 22.2                |           | DRAIN PIPING FOR VRF   |        |       |          |          |                      |                      |
|                     | NSR       | Supply & laying of piping for drain piping<br>With 13 mm Class 'O' closed cell Nitrile Rubber insulation   |        |       |          |          |                      |                      |
| 22.2.1              | NSR       | 25 dia NB(PVC HEAVY CLASS)   | 350    | Meter |          | 232.00   |                      | 81,200.00            |
| 2.18.3.1            | NSR       | 32 dia NB(PVC HEAVY CLASS)   | 65     | Meter |          | 278.00   |                      | 18,070.00            |
| 2.18.3.1            | NSR       | 40 dia NB(PVC HEAVY CLASS)   | 36     | Meter |          | 298.00   |                      | 10,728.00            |
|                     |           | <b>TOTAL CARRIED TO SUMMARY</b>  |        |       |          |          | <b>40,038,526.50</b> | <b>60,715,367.00</b> |
| <b>SUB HEAD 'C'</b> |           | <b>DUCTING, GRILLS, DIFFUSER AND INSULATION (CFC/HCFC-FREE)</b>  |        |       |          |          |                      |                      |
| 1                   | 16.12.1   | Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.  |        |       |          |          |                      |                      |
| 1.1                 | 16.12.1.1 | 24 gauge galvanized sheet steel (0.63mm)   | 55,646 | Sq.m  | 739      |          | 41,122,394.00        | -                    |
| 1.2                 | 16.12.1.2 | 22 gauge galvanized sheet steel (0.80mm)   | 26,516 | Sq.m  | 905      |          | 23,996,980.00        | -                    |
| 1.3                 | 16.12.1.3 | 20 gauge galvanized sheet steel (1.00mm)   | 7,128  | Sq.m  | 1,014    |          | 7,227,792.00         | -                    |
| 1.4                 | 16.12.1.4 | 18 gauge galvanized sheet steel (1.25mm)   | 11,858 | Sq.m  | 1,278    |          | 15,154,524.00        | -                    |
| 2                   | NSR       | FACTORY FABRICATED ALUMINIUM DUCT<br>Supply, fabrication, installation and testing of aluminium ducts in accordance with the approved shop floor drawing and specifications. Material should confirm to IS 737 latest edition.   |        |       |          |          |                      |                      |
| 2.1                 | i         | AL sheet 0.8 mm thick  | 1,984  | Sq.m  |          | 1,064.00 | -                    | 2,110,976.00         |
| 2.2                 | ii        | AL sheet 1.00 mm thick   | 4,673  | Sq.m  |          | 1,228.00 | -                    | 5,738,444.00         |
| 2.3                 | iii       | AL sheet 1.5 mm thick  | 5,767  | Sq.m  |          | 1,359.00 | -                    | 7,837,353.00         |
| 3                   | NSR       | MS ducting<br>Supply, fabrication, Installation, testing and commissioning of 16 G CRCA MS Sheet metal ducts (welded) in accordance with the approved shop drawings and complete with factory fabricated wire rope based supporting arrangement as per specifications. Ducts shall be painted with fire resistant paint and shall be suitable for 250 Deg C and the supporting arrangement shall be strong enough to with stand fire conditions. | 1,530  | Sq.m  |          | 2,660.00 | -                    | 4,069,800.00         |



| S No. | Code No | Item Description   | Qty    | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|--------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3      | 4    | 5        | 6        | 6                | 8                |
| 4     | 16.25   | Thermal Insulation For kitchen Exhaust Air Ducts<br>Supply and installation of External thermal insulation on ducts 50mm thick Fibre Glass Cr-150, Density 24 Kg / M <sup>3</sup> , Secured with CPRX compound & finished with Aluminum foil.  | 1,530  | Sq.m | 437      |          | 668,610.00       | -                |
|       |         | Duct Thermal Insulation for IPD  |        |      |          |          |                  |                  |
| 5     | 16.23   | Supplying and fixing of following thickness duly laminated aluminum foil of mat finish closed cell Nitrile rubber (Class "O") insulation on existing duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.  |        |      |          |          | -                | -                |
| 5.1   | 16.23.1 | 19 mm  | 46,170 | Sq.m | 821      |          | 37,905,570.00    | -                |
| 5.2   | 16.23.2 | 25 mm  | 30,780 | Sq.m | 1,034    |          | 31,826,520.00    | -                |
|       |         | Duct Thermal Insulation for all other Areas  |        |      |          |          |                  |                  |
| 6     | NSR     | Supplying and fixing of Fiberglass insulation with factory laminated WMPVR R Plus (Polypropylene foil as vapor barrier). Density of fiberglass should be 32kg/m <sup>3</sup> . CPRX or Rubber base Adhesive can be used to paste the fiberglass insulation over the GI duct.   |        |      |          |          |                  |                  |
|       |         | RA (Return Air duct) - 25 mm   | 7,452  | Sq.m |          | 289.00   | -                | 2,153,628.00     |
|       |         | SA (Supply Air duct)- 50 mm  | 1,053  | Sq.m |          | 451.00   | -                | 474,903.00       |
|       | NSR     | Supply Air Ducts in unconditioned space / Shafts   |        |      |          |          |                  |                  |
| 7     |         | Supplying and fixing of 50 mm thick, 32 Kg / M <sup>3</sup> density Fiberglass insulation having WMPVR R Plus (Polypropylene foil as vapor barrier) secured with approved adhesive. All insulation shall be provided with the protective coating as per BS 476 Part-7, Class-'1', IS101(Part-2/Sec-2)/1986 and IS 101 (Part-2/Sec-1)/1988 starbond 30-36 WP with three coat with the reinforcement as per IS 11871 glass fiber cloth . Each coat should be dry before another coat. The coverage of each coat not less than 1 kg. per 43.04 sq. ft. (4m <sup>2</sup> /coat). | 8,667  | Sq.m |          | 459.00   | -                | 3,978,153.00     |
| 8     |         | Supplying and fixing of 25mm thick, 40-60 Kg / M <sup>3</sup> density closed cell elastomeric nitrile rubber class 'O' secured with approved adhesive. The insulation shall be finished with 7 mil woven glass cloth with UV resistant paint. (For Out Door application)   | 567    | Sq.m |          | 808.00   | -                | 458,136.00       |

| S No. | Code No | Item Description   | Qty   | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-------|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3     | 4    | 5        | 6        | 6                | 8                |
| 9     |         | Supply and fixing of acoustic lining of supply air duct and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m <sup>3</sup> , with 25 mm X 25 mm GI section of 1.25 mm thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminum sheet fixed to inside surface of ducts with cadmium plated nuts, bolts, stick pins, CPRX compound etc. complete as required and as per specifications.   | 486   | Sq.m |          | 201.00   | -                | 97,686.00        |
|       |         | Fire rated paint on smoke exhaust GI duct:-  |       |      |          |          |                  |                  |
| 10    |         | Supply and applying fire resistant paint on factory fabricated GSS sheet metal ducting to achieve 2 hrs 250 degC fire ratings as per manufacturer standards.   |       |      |          |          |                  |                  |
| 10.1  |         | Fire resistant paint CBRI or equivalent approved .   | 2,700 | Sq.m |          | 1,400.00 | -                | 3,780,000.00     |
| 11    | 16.21   | Supply and fixing of acoustic lining of supply air duct and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m <sup>3</sup> , with 25 mm X 25 mm GI section of 1.25 mm thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminum sheet fixed to inside surface of ducts with cadmium plated nuts, bolts, stick pins, CPRX compound etc. complete as required and as per specifications.   | 90    | Sq.m | 551      |          | 49,590.00        | -                |
| 12    | 16.2    | Supplying, Fixing,testing and commissioning of UL listed fire dampers in supply air duct/main branch and return air path as and where required of required sizes i/c control wiring,the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed in the event of fire signal complete as required and as per specifications. The damper shall be as per latest edition of UL 555S and shall be classified as leakage class 1 smoke damper in accordance with latest version of UL555S.The damper actuator shall be BMS Compatible and ON/OFF type. The actuator shall provide open and close feedback to BMS System. |       |      |          |          |                  |                  |
| 12.1  | 16.20.1 | Fire dmaper  | 372   | Sq.m | 7,103    |          | 2,642,316.00     | -                |
| 12.2  | 16.20.2 | Actuator   | 398   | Nos. | 6,604    |          | 2,628,392.00     | -                |
| 13    |         | UVGI SYSTEM  |       |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty   | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-------|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3     | 4    | 5        | 6          | 6                | 8                |
|       |         | Supply, Installation, Testing and Commissioning of Ultra Violet Germicidal Irradiations, (UVGI) System for Improvement of Indoor Air Quality and Energy Saving on AHU's Coil as per Specifications. The Average Life of UV lamps Shall be 9000 hrs. The UVGI System shall consist of UV lamps, reflector with its mounting assembly and control panel. The Control Panel shall be mounted outside the AHU and should Consist of ballast, hour meter, MCB, Indicating Light. The ballast and UV lamps shall be of instant start type. The Prices to include inter connected wiring between the UVGI lamps and panel. Alternatively the ballast may also be installed inside the reflector assembly itself depending on manufacturer's design. System shall comply with UL standard 1995 as applicable to usage of UVGI system in HVAC equipment. Subject to complying with the specifications. |       |      |          |            |                  |                  |
| 13.1  |         | 2000 CFM - 5000 CFM   | 10    | Nos. |          | 85,094.00  | -                | 850,940.00       |
| 13.2  |         | 5001 CFM - 8000 CFM   | 10    | Nos. |          | 127,594.00 | -                | 1,275,940.00     |
| 13.3  |         | 8001 CFM - 12000 CFM  | 15    | Nos. |          | 169,812.00 | -                | 2,547,180.00     |
| 13.4  |         | 12001 CFM - 16000 CFM   | 5     | Nos. |          | 212,688.00 | -                | 1,063,440.00     |
| 14    | 16.16   | Supplying, fixing of powder coated extruded aluminium section exhaust air grills without aluminium volume control dampers as per specifications.  | 52    | Sq.m | 4,065    |            | 211,380.00       | -                |
| 15    | 16.16   | Supplying, fixing of powder coated extruded aluminium section return air grills with louvers but without aluminium volume control dampers as per specifications.  | 49    | Sq.m | 4,065    |            | 199,185.00       | -                |
| 16    | 16.15   | Supplying, fixing of powder coated extruded aluminium section supply air grills with aluminium volume control dampers as per specifications.  | 112   | Sq.m | 7,132    |            | 798,784.00       | -                |
| 17    | 16.13   | Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc. as per specifications.   | 224   | Sq.m | 5,463    |            | 1,223,712.00     | -                |
| 18    | 16.17   | Supplying, fixing, testing & commissioning of supply air diffusers of powder coated aluminium with aluminium volume control dampers with anti smudge ring & removable core.   | 524   | Sq.m | 8,686    |            | 4,551,464.00     | -                |
| 19    | 16.18   | Supplying, fixing, testing & commissioning of return air diffusers of powder coated aluminium without volume control dampers with anti smudge ring & removable core   | 1,096 | Sq.m | 5,619    |            | 6,158,424.00     | -                |
|       |         | SWIRL DIFFUSERS   |       |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|-------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4     | 5        | 6        | 6                | 8                |
| 20    | NSR     | Supplying, fixing testing commissioning of supply air <b>Swirl diffusers</b> with adjustable air control blades of powder coated aluminium with volume control damper and UL certified <b>volume flow limiter</b> and plenum                            | 85  | Sq.m  |          | 8,130.00 | -                | 691,050.00       |
|       |         | LAMINAR FLOW DIFFUSERS  |     |       |          |          |                  |                  |
| 21    | NSR     | Providing & fixing of 18swg aluminium powder coated non-respiratory 100% air tight laminar flow diffusers. LFDs shall have 50% perforation.The perforated front face is oenable hinge type complete with key operated opposed blade dampers from front. |     |       |          |          |                  |                  |
| 21.1  | NSR     | Size: 1200 x 600  | 45  | Nos.  |          | 9,771.00 | -                | 439,695.00       |
|       |         | SUPPLY AIR SLOT DIFFUSERS   |     |       |          |          |                  |                  |
| 22    | NSR     | Supply, installation, testing & commissioning of Extruded Aluminium powder coated Supply Air Slot Diffusers with factory fabricated & accoustically lined supply air plenum and with hit & miss damper.   |     |       |          |          |                  |                  |
| 22.1  | a.      | 1 Slot (20mm gap)   | 15  | Meter |          | 1,083.00 | -                | 16,245.00        |
| 22.2  | b.      | 2 Slot (20mm gap)   | 35  | Meter |          | 1,482.00 | -                | 51,870.00        |
| 22.3  | c.      | 3 Slot (20mm gap)   | 55  | Meter |          | 1,936.00 | -                | 106,480.00       |
| 22.4  | d.      | 4 Slot (20mm gap)   | 12  | Meter |          | 2,416.00 | -                | 28,992.00        |
|       |         | RETURN AIR / EXHAUST AIR SLOT DIFFUSERS   |     |       |          |          |                  |                  |
| 23    | NSR     | Supply, installation, testing & commissioning of Extruded Aluminium powder coated Return Air/ Exhaust Air slot diffusers without plenum & without damper.   |     |       |          |          |                  |                  |
| 23.1  | a.      | 1 Slot (20mm gap)   | 15  | Meter |          | 835.00   | -                | 12,525.00        |
| 23.2  | b.      | 2 Slot (20mm gap)   | 35  | Meter |          | 1,134.00 | -                | 39,690.00        |
| 23.3  | c.      | 3 Slot (20mm gap)   | 55  | Meter |          | 1,482.00 | -                | 81,510.00        |
| 23.4  | d.      | 4 Slot (20mm gap)   | 12  | Meter |          | 1,820.00 | -                | 21,840.00        |
| 24    | NSR     | Supply, installation, testing & commissioning of fan discharge / outlet back draft dampers of heavy gauge GSS Construction complete with frame & necessary civil work for fixing.   | 5   | Sq.m  |          | 7,506.00 | -                | 37,530.00        |
| 25    | 16.14   | Supply, installation, testing and commissioning of Motorized (ON-OFF Type) duct mounted GI volume control damper with enthalpy sensor and necessary control wire (minimum 1.5 sq. mm) for integration within AHU room                                   |     |       |          |          |                  |                  |
| 25.1  | 16.14.1 | Damper  | 80  | Sq.m  | 6,308    |          | 504,640.00       | -                |
| 25.2  | 16.14.2 | Actuator  | 125 | Nos.  | 5,483    |          | 685,375.00       | -                |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
| 26    | NSR     | Supply, installation, testing & commissioning of Extruded aluminum exhaust air/fresh air louvers without GI Bird Screen as per specifications. The louvers shall be anodized aluminum as per approval of the Architect and offering free area not less than 60% of gross face area.   | 169 | Sq.m |          | 6,410.00 | -                | 1,083,290.00     |
| 27    | 16.22   | Supplying, fixing acoustic lining on wall and ceiling of AHU rooms with 50 mm thick, density 32 kg/cu.m resin bonded glass fiber insulation (CFC/HCFC-free) friction fixed in 610 mm x 610 mm frame work made of 25X50X50X50X25 mm made out of 0.6mm thick GI sheet U shaped channel and covered with reinforced fiber glass tissue and finished with 0.80 mm perforated aluminium sheet etc. complete as required and as per specifications. | 130 | Sq.m | 870      |          | 113,100.00       | -                |
| 28    | NSR     | VAV BOXES:  |     |      |          |          |                  |                  |
|       |         | Supply, installation, testing & commissioning of following VAV Boxes:   |     |      |          |          |                  |                  |
|       |         | Quoted prices to include cost of equipment including, Packing, Forwarding charges, Transport Charges, Transit insurance & Testing etc. and with factory fabricated GI supports and fixing arrangement   |     |      |          |          |                  |                  |
|       |         | VAVs shall be pressure independent type & low velocity type, cooling only (Without heating coils / strips)  |     |      |          |          |                  |                  |
|       |         | VAV Boxes shall be slow reacting type capable of delivering variable air volume type by the action of opposed blade volume control damper   |     |      |          |          |                  |                  |
|       |         | VAV boxes shall be supplied with end flanges for attachment to flanged duct ends and shall be complete with all internal Acoustic treatment.  |     |      |          |          |                  |                  |
|       |         | The casing shall be double skin type of Galvanized sheet steel construction with a completely sealed, easily removable. The access shall be provided in the bottom side only.   |     |      |          |          |                  |                  |
|       |         | VAV shall be electronically controlled networkable controller type complete with low leakage damper actuator, Microprocessor unit, wall / ceiling mounted temperature sensor with ON/OFF Switch, control transformer, unit hanger brackets etc.   |     |      |          |          |                  |                  |
|       |         | VAV Boxes shall also be able to reset any air flow between zero and the maximum air quantity that the boxes can handle without changing orifices or other parts, but the boxes shall be factory set at 20% of the maximum flow as minimum flow.   |     |      |          |          |                  |                  |
|       |         | The noise level from the VAV boxes shall not exceed 30dba at 1m   |     |      |          |          |                  |                  |
|       |         | The quoted price shall be inclusive of the temperature sensor for each VAV unit & associated cable required for the functioning of the VAV system   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|       |         | The temperature sensor and the entire control mechanism shall be fully compatible with third party Building Management System. Datas like temperatures, set points, damper position shall be monitored through BMS system   |     |      |          |           |                  |                  |
|       |         | Thermostat shall be digital type, controllable from within the room and by the BMS simultaneously.  |     |      |          |           |                  |                  |
|       |         | The capacities of the units with the above specification are as follows:  |     |      |          |           |                  |                  |
| 28.1  | NSR     | 225 CFM   | 240 | Nos. |          | 21,579.00 | -                | 5,178,960.00     |
| 28.2  | NSR     | 350 CFM   | 247 | Nos. |          | 21,579.00 | -                | 5,330,013.00     |
| 28.3  | NSR     | 500 CFM   | 135 | Nos. |          | 21,579.00 | -                | 2,913,165.00     |
| 28.4  | NSR     | 900 CFM   | 195 | Nos. |          | 21,703.00 | -                | 4,232,085.00     |
| 28.5  | NSR     | 1400 CFM  | 162 | Nos. |          | 22,052.00 | -                | 3,572,424.00     |
| 28.6  | NSR     | 2000 CFM  | 139 | Nos. |          | 22,492.00 | -                | 3,126,388.00     |
| 28.7  | NSR     | 3000 CFM  | 35  | Nos. |          | 23,405.00 | -                | 819,175.00       |
| 28.8  | NSR     | 4000 CFM  | 21  | Nos. |          | 24,899.00 | -                | 522,879.00       |
| Note: |         | Samples of grilles / diffusers / dampers will have to be submitted to the Architects for approval on size / shape / shade / colour approvals before ordering.   |     |      |          |           |                  |                  |
| 29    | NSR     | <b>Duct Pressure Sensor</b> to be Mounted in SA duct upstream and capable to control the VFD on back pressure from SA duct complete with control cabling from sensor to VFD. Control cabling shall be with MS conduit   | 208 | Set  |          | 3,886.00  | -                | 808,288.00       |
| 30    | NSR     | Strip Heaters   |     |      |          |           |                  |                  |
|       |         | <b>Supply, Installation, testing &amp; Commissioning</b> of monsoon reheating arrangement fixed in ducts/ plenums complete with strip heaters, fixing frame work , insulators, fire protection insulation in duct, controls such as heating thermostats, humidistats etc. The heaters banks shall be controlled by independent thermostats / humisistats / through electro magnetic type contractors and safety thermostats / geysersstats as specified complete with wiring for interconnections with 1.5 sq. mm. copper conductor multi core armoured cable. The heater capacity shall be as per schedule of equipment and specifications, drawing etc. | -   |      |          |           | -                | -                |
| 30.1  |         | 2 KWx 2 banks   | 2   | Nos. |          | 45,000.00 | -                | 90,000.00        |
| 30.1  |         | 3 KWx 2 banks   | 2   | Nos. |          | 52,000.00 | -                | 104,000.00       |
| 31    | NSR     | Pan type Humidifier   |     |      |          |           |                  |                  |

| S No.               | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items      | Amount NSR Items     |
|---------------------|---------|--|-----|------|----------|-----------|-----------------------|----------------------|
| 1                   | 1A      | 2  | 3   | 4    | 5        | 6         | 6                     | 8                    |
| 31.1                |         | Supply, installation, testing and commissioning of electric pan type humidifiers in each Air Handling Rooms to provide humidification during winter months heating operation. The humidifier shall evaporate 12 liters water per hour and complete with all required water valves incoming MCB, humidistat and ,electrical & control wiring and earthing as required.  | 2   | Nos. |          | 32,000.00 | -                     | 64,000.00            |
|                     |         | <b>TOTAL CARRIED TO SUMMARY</b>  |     |      |          |           | <b>177,668,752.00</b> | <b>65,808,673.00</b> |
| <b>SUB HEAD 'D'</b> |         | <b>ELECTRICAL WORKS</b>  |     |      |          |           |                       |                      |
| 1                   |         | Design, Supplying,Installation, testing and commissioning of following cubical Design verified as per IEC61439 suitable for 415V, 3 Phase,4 wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA/Aluzinc sheet steel of 2mm thick for frame work and covers, Mounting Plate and all Internal parts shall be made of 1.6/2.0 mm Aluzinc sheet for better Heat Dessipation, 3mm thick for gland plates i/c cleaning & finishing completed 7 tank process of powder coating in approved shade,having E-91 grade TPN Aluminium alloy bus bars of minimum 56% IACS conductivity,with short circuit withstand capacity for 1 sec as per BOM. |     |      |          |           |                       |                      |
|                     |         | Bottom base channel of MS section not less that 100 mm x 50mm x 5mm thick, fabrication shall be done transportable sections,entire panel shall have a common copper earth bar of size 25mmx5mm at the rear with 2 no's earth stud,solid connections from main bus bar to switchgears with required size of aluminium bus bars and control wiring PVC insulated copper conductor S/C cable alleys,cable gland plates in two half,i/c providing following switch gears: (with all necessary hardware, accessories as required for complete installation as per specifications and single line digram).LT Panel should be as per IEC-61439-1 & 2.                 |     |      |          |           |                       |                      |
| 1.1                 | NSR     | AHU PANEL-1&2- Level-0   |     |      |          |           |                       |                      |
|                     |         | IP Rating : IP-65  |     |      |          |           |                       |                      |
|                     |         | Incomer :  |     |      |          |           |                       |                      |
|                     |         | • 1 No.400 A 3P, MCCB, 25KA .  |     |      |          |           |                       |                      |
|                     |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |           |                       |                      |
|                     |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |           |                       |                      |
|                     |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |           |                       |                      |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Incomer Indications :   |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering :  |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 600 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                            |     |      |          |          |                  |                  |





| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 800 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 4 No. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.                              |     |      |          |          |                  |                  |
|       |         | • 7 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                             |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | • 4 No. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.  |     |      |          |            |                  |                  |
|       |         | • 7 Nos. suitable rated 25 KA, 3P, MPCB suitable for 0.75 KW AHU motor.  |     |      |          |            |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.1 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | Spares:  |     |      |          |            |                  |                  |
|       |         | •1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.  |     |      |          |            |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
|       |         | Notes:   |     |      |          |            |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel-1- Level-1 as described above.   | 1   | Set  |          | 756,000.00 | -                | 756,000.00       |
| 1.3   | NSR     | AHU PANEL-2- Level-1   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 630 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications :   |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering :  |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 800 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 18.5 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 8 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 6 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 2 No. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 4 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.1 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 8 Nos. suitable rated 25 KA, 3P, MPCB suitable for 0.75 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | Spares:  |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 18.5 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         |  |     |      |          |          |                  |                  |
|       |         | Notes:   |     |      |          |          |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |          |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |          |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |          |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |          |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |          |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |          |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |          |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |          |                  |                  |
|       |         |  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | AHU Panel-2- Level-1 as described above.  | 1   | Set  |          | 787,500.00 | -                | 787,500.00       |
| 1.4   | NSR     | AHU PANEL-3&4- Level-1  |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65   |     |      |          |            |                  |                  |
|       |         | Incomer :   |     |      |          |            |                  |                  |
|       |         | • 1 No. 400 A, 3P, MCCB, 25KA of suitable rating as per load.                                     |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |            |                  |                  |
|       |         | Incomer Indications :   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |            |                  |                  |
|       |         | Incomer Metering :  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |            |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |            |                  |                  |
|       |         | Bus Bars:   |     |      |          |            |                  |                  |
|       |         | • 600 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |            |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 18.5 KW AHU motor.                       |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.                          |     |      |          |          |                  |                  |
|       |         | • 1Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                          |     |      |          |          |                  |                  |
|       |         | • 7 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                         |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.                         |     |      |          |          |                  |                  |
|       |         | • 6 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.1 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         | • 8 Nos. suitable rated 25 KA, 3P, MPCB suitable for 0.75 KW AHU motor.                       |     |      |          |          |                  |                  |
|       |         | Spares:   |     |      |          |          |                  |                  |
|       |         | •1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 18.5 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 15 KW AHU motor.                         |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                         |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                        |     |      |          |          |                  |                  |
|       |         |   |     |      |          |          |                  |                  |
|       |         | Notes:  |     |      |          |          |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch. |     |      |          |          |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.  |     |      |          |          |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.                           |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel-3&4- Level-1 as described above.   | 2   | Set  |          | 787,500.00 | -                | 1,575,000.00     |
| 1.5   | NSR     | AHU PANEL- Level-2   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 250 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|       |         | Incomer Indications :  |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering :   |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for metering PT:  |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Bus Bars:  |     |      |          |            |                  |                  |
|       |         | • 300 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.   |     |      |          |            |                  |                  |
|       |         | Bus PT for outgoing:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|       |         | Outgoings :  |     |      |          |            |                  |                  |
|       |         | • 3 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 9 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | Spares:  |     |      |          |            |                  |                  |
|       |         | •2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | •2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.  |     |      |          |            |                  |                  |
|       |         | Notes:   |     |      |          |            |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel- Level-2 as described above.   | 1   | Set  |          | 156,250.00 | -                | 156,250.00       |
| 1.6   | NSR     | AHU PANEL- Level-3   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | IP Rating : IP-65   |     |      |          |          |                  |                  |
|       |         | Incomer :   |     |      |          |          |                  |                  |
|       |         | • 1 No. 400 A 3P, MCCB, 25KA of suitable rating as per load.                                      |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications :   |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering :  |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 500 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|        |         | Outgoings :  |     |      |          |            |                  |                  |
|        |         | • 14 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.  |     |      |          |            |                  |                  |
|        |         | • 2 No. suitable rated 25 KA, 3P, MPCB suitable for 3.7 KW AHU motor.  |     |      |          |            |                  |                  |
|        |         | Spares:  |     |      |          |            |                  |                  |
|        |         | •2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.   |     |      |          |            |                  |                  |
|        |         | •1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.   |     |      |          |            |                  |                  |
| Notes: |         |  |     |      |          |            |                  |                  |
| 1      |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2      |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3      |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4      |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5      |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6      |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.     |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.     |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|        |         | AHU Panel- Level-3 as described above.   | 1   | Set  |          | 500,000.00 | -                | 500,000.00       |
| 1.7    | NSR     | AHU PANEL- Level-4   |     |      |          |            |                  |                  |
|        |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|        |         | Incomer :  |     |      |          |            |                  |                  |
|        |         | • 1 No. 250 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|        |         | Incomer Indications :  |     |      |          |            |                  |                  |
|        |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering :  |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 300 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 4 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                              |     |      |          |          |                  |                  |
|       |         | • 6 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 2 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                             |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Spares:  |     |      |          |            |                  |                  |
|       |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.  |     |      |          |            |                  |                  |
|       |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
|       |         | Notes:   |     |      |          |            |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel- Level-4 as described above.   | 1   | Set  |          | 312,500.00 | -                | 312,500.00       |
| 1.8   | NSR     | AHU PANEL- Level-5 & 6   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 400 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
|       |         | Incomer Indications :  |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
|       |         | Incomer Metering :   |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 500 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 4 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                              |     |      |          |          |                  |                  |
|       |         | • 12 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 2 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 3 No. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 4 No. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | Spares:   |     |      |          |          |                  |                  |
|       |         | • 2 No. suitable rated 25 KA, 3P, MPCB suitable for 11 KW AHU motor.                              |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.   |     |      |          |            |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.   |     |      |          |            |                  |                  |
|       | Notes:  |  |     |      |          |            |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel- Level-5 & 6 as described above.   | 1   | Set  |          | 500,000.00 | -                | 500,000.00       |
| 1.9   | NSR     | AHU PANEL - AYUSH BLOCK  |     |      |          |            |                  |                  |
|       |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 63 A 3P, MCCB, 25KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|       |         | Incomer Indications :  |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering :   |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|        |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|        |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|        |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|        |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|        |         | Bus Bars:   |     |      |          |          |                  |                  |
|        |         | • 100 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|        |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|        |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|        |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|        |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|        |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|        |         | Outgoings :   |     |      |          |          |                  |                  |
|        |         | •7 No. suitable rated 25 KA, 3P, MPCB suitable for 1.5 HP AHU motor.                              |     |      |          |          |                  |                  |
|        |         | •3 No. suitable rated 25 KA, 3P, MPCB suitable for 2 HP AHU motor.                                |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 3 HP AHU motor.                                |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 5 HP AHU motor.                                |     |      |          |          |                  |                  |
|        |         | Spares:   |     |      |          |          |                  |                  |
|        |         | •2 No. suitable rated 25 KA, 3P, MPCB suitable for 1.5 HP AHU motor.                              |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 3 HP AHU motor.                                |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 5 HP AHU motor.                                |     |      |          |          |                  |                  |
| Notes: |         |   |     |      |          |          |                  |                  |
| 1      |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.     |     |      |          |          |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel as described above.  | 1   | Set  |          | 100,000.00 | -                | 100,000.00       |
| 1.10  | NSR     | CHILLER AUXILIARY PANEL-1  |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-42  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 1000 A 3P, MDO, ACB, 50 KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • ACB shall be with inbuilt micro-processor based O/C, S/C & E/F releases.   |     |      |          |            |                  |                  |
|       |         | • All releases shall be with adjustable trip settings.   |     |      |          |            |                  |                  |
|       |         | • ACB with 4NO + 4NC contacts and an auxiliary trip contact for BMS.   |     |      |          |            |                  |                  |
|       |         | • ACB shall be inbuilt trip LED.   |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 1250 A, 3P, 50 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.                                |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.                          |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:                                      |     |      |          |          |                  |                  |
|       |         | • 1 No. 415V / 55-0-55 V, cast resin control transformer.  |     |      |          |          |                  |                  |
|       |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|       |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.                                     |     |      |          |          |                  |                  |
|       |         | • 110V control bus.  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer. |     |      |          |          |                  |                  |
|       |         | Outgoings:   |     |      |          |          |                  |                  |
|       |         | Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 3 Nos. 30 KW Primary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 75 KW Condensor Water Pump.   |     |      |          |          |                  |                  |
|       |         | Spare Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 1 Nos. 30 KW motor.  |     |      |          |          |                  |                  |
|       |         | • 1 Nos. 75 KW motor.  |     |      |          |          |                  |                  |
|       |         | Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 75 KW Secondary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 1 No. 37.5 KW Secondary CHW Pump.  |     |      |          |          |                  |                  |
|       |         | • 8 Nos. 7.5 KW Cooling Tower Fans.  |     |      |          |          |                  |                  |
|       |         | Spare Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 75 KW Secondary CHW Pump.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | • 1 No. 37.5 KW Secondary CHW Pump.  |     |      |          |            |                  |                  |
|       |         | • 2 Nos. 7.5 KW Cooling Tower Fans.  |     |      |          |            |                  |                  |
| Note: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.    |     |      |          |            |                  |                  |
|       |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.         |     |      |          |            |                  |                  |
|       |         | 3. For VFD feeders, panel should be provided with sufficient VFD space incorporated within panel only. |     |      |          |            |                  |                  |
|       |         | Chiller Auxiliary Panel-1 as described above.  | 1   | Set  |          | 950,000.00 | -                | 950,000.00       |
| 1.11  | NSR     | CHILLER AUXILIARY PANEL-2  |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-42  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No.1000 A 3P, MDO, ACB, 50 KA of suitable rating as per load.                                      |     |      |          |            |                  |                  |
|       |         | • ACB shall be with inbuilt micro-processor based O/C, S/C & E/F releases.                             |     |      |          |            |                  |                  |
|       |         | • All releases shall be with adjustable trip settings.   |     |      |          |            |                  |                  |
|       |         | • ACB with 4NO + 4NC contacts and an auxiliary trip contact for BMS.                                   |     |      |          |            |                  |                  |
|       |         | • ACB shall be inbuilt trip LED.   |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                              |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                          |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 1250 A, 3P, 50 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.                                |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.                          |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:                                      |     |      |          |          |                  |                  |
|       |         | • 1 No. 415V / 55-0-55 V, cast resin control transformer.  |     |      |          |          |                  |                  |
|       |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|       |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.                                     |     |      |          |          |                  |                  |
|       |         | • 110V control bus.  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer. |     |      |          |          |                  |                  |
|       |         | Outgoings:   |     |      |          |          |                  |                  |
|       |         | Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 30 KW Primary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 3 No. 75 KW Condenser water pumps.   |     |      |          |          |                  |                  |
|       |         | Spare Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 75 KW motor.   |     |      |          |          |                  |                  |
|       |         | • 1 No. 30 KW motor.   |     |      |          |          |                  |                  |
|       |         | Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 75 KW Secondary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 37.5 KW Secondary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 12 Nos. 7.5 KW Cooling Tower Fans.   |     |      |          |          |                  |                  |
|       |         | Spare Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 75 KW Secondary CHW Pump.  |     |      |          |          |                  |                  |
|       |         | • 1 No. 37.5 KW Secondary CHW Pump.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | • 2 Nos. 7.5 KW Cooling Tower Fans.  |     |      |          |            |                  |                  |
| Note: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.    |     |      |          |            |                  |                  |
|       |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.         |     |      |          |            |                  |                  |
|       |         | 3. For VFD feeders, panel should be provided with sufficient VFD space incorporated within panel only. |     |      |          |            |                  |                  |
|       |         | Chiller Auxiliary Panel-2 as described above.  | 1   | Set  |          | 950,000.00 | -                | 950,000.00       |
| 1.12  | NSR     | OT - CHILLER AUXILIARY PANEL   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-42  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 250 A 3P, MCCB, 35KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                                 |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                                  |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                              |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                          |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 300 A, 3P, 35 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.                                 |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.                          |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:                                      |     |      |          |          |                  |                  |
|       |         | • 1 No. 415V / 55-0-55 V, cast resin control transformer.  |     |      |          |          |                  |                  |
|       |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|       |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.                                     |     |      |          |          |                  |                  |
|       |         | • 110V control bus.  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer. |     |      |          |          |                  |                  |
|       |         | Outgoings:   |     |      |          |          |                  |                  |
|       |         | Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 15 KW Primary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 2. No. 37.8 KW Condenser water pumps.  |     |      |          |          |                  |                  |
|       |         | Spare Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 37.8 KW motor.   |     |      |          |          |                  |                  |
|       |         | • 1 No. 15 KW motor.   |     |      |          |          |                  |                  |
|       |         | Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 30 KW Secondary CHW Pump.   |     |      |          |          |                  |                  |
|       |         | • 8 Nos. 5.5 KW Cooling Tower Fans.  |     |      |          |          |                  |                  |
|       |         | Spare Feeders without starters:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 30 KW Secondary CHW Pump.  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 5.5 KW Cooling Tower Fans.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| Note: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.    |     |      |          |            |                  |                  |
|       |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.         |     |      |          |            |                  |                  |
|       |         | 3. For VFD feeders, panel should be provided with sufficient VFD space incorporated within panel only. |     |      |          |            |                  |                  |
|       |         | OT Chiller Auxiliary Panel as described above.   | 1   | Set  |          | 175,000.00 | -                | 175,000.00       |
| 1.13  | NSR     | STAIR CASE & LIFT WELL PR. FAN PANEL   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|       |         | Incomer:   |     |      |          |            |                  |                  |
|       |         | • 1 No. 250 A 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                                 |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                                  |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                              |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                          |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                         |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | Bus Bars:  |     |      |          |            |                  |                  |
|        |         | • 300 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.   |     |      |          |            |                  |                  |
|        |         | Bus PT for outgoing:   |     |      |          |            |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |            |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|        |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.   |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 5 Nos. 7.5 KW stair case Pr. Fan.  |     |      |          |            |                  |                  |
|        |         | • 10 Nos. 5.5 KW lift lobby Pr. fan.   |     |      |          |            |                  |                  |
|        |         | • 6 Nos. 2.2 KW lift well Pr. fan.   |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 7.5 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 5.5 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 2.2 KW motor.  |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan Panel Panel as described above.   | 1   | Set  |          | 175,000.00 | -                | 175,000.00       |



| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
| 1.14  | NSR     | STAIR CASE & LIFT WELL PR. FAN PANEL - AYUSH BLOCK  |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 65   |     |      |          |          |                  |                  |
|       |         | Incomer:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 125 A 3P, MCCB, 25 KA of suitable rating as per load.                                     |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications:  |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:   |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)   |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 200 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at ± 2.5%, ±5%, 50HZ, center tap earthed.  |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 8 Nos. 3.75 KW stair case Pr. Fan.   |     |      |          |            |                  |                  |
|        |         | • 4 Nos.5.5 KW stair case Pr. Fan.   |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 3.75 KW stair case Pr. Fan.   |     |      |          |            |                  |                  |
|        |         | • 1 Nos.5.5 KW stair case Pr. Fan.   |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan Panel Panel as described above.   | 1   | Set  |          | 175,000.00 | -                | 175,000.00       |
| 1.15   | NSR     | STARTER PANEL - DOL / STAR DELTA STARTER   |     |      |          |            |                  |                  |
|        |         | Each Fan Starter Panel shall have :  |     |      |          |            |                  |                  |
|        | a.      | 14G CRCA Powder Coated panel enclosure with earthing studs & hinged locable doors. IP55 Protection, suitable for 415V, 3 Phase, 4 wire, 50HZ system.   |     |      |          |            |                  |                  |
|        | b.      | Type-II co-ordination switchgear.  |     |      |          |            |                  |                  |
|        | c.      | Incomer switch shall be TP MPCB of required rating & fault withstand capacity. MPCB shall be with overload & short circuit protection.                 |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
|       | d.      | R,Y,B LED Type Phase indication lamps with control MCB's.   |     |      |          |           |                  |                  |
|       | e.      | Auto / Manual Selector switch & ON & OFF Push buttons for manual operation & terminals for BMS wiring.  |     |      |          |           |                  |                  |
|       | f.      | ON' Indication LED Type lamp with control MCB.  |     |      |          |           |                  |                  |
|       | g.      | DOL Starter / Contactor for motors upto 10HP, with 2 NO + 2 NC Auxiliary contacts.  |     |      |          |           |                  |                  |
|       | h.      | Star-Delta starter / contactors / timers for motors beyond 10HP, with 2 NO + 2 NC Auxiliary contacts.   |     |      |          |           |                  |                  |
|       | i.      | All internal control & power wiring.  |     |      |          |           |                  |                  |
|       | j.      | Voltage operated 'SPP' (Single Phasing Preventor) for 10HP & above rating motors.   |     |      |          |           |                  |                  |
|       | k.      | Cast resin CT's (3 Nos. for more than 5HP motors) & single CT for motors upto 5HP for metering purposes. CT's shall be of required class & burden.  |     |      |          |           |                  |                  |
|       | l.      | *Digital VA Meter (BMS / Non BMS compatible).   |     |      |          |           |                  |                  |
|       | m.      | Control terminals / linkage / interlocking with fire detection system & fire dampers, so that Fresh air Fan motor trips on receiving a fire signal & normal & smoke exhaust fans start on receiving a fire signal. Manual control shall also be possible through an override. |     |      |          |           |                  |                  |
|       | i       | Fan Starter Panel for 5 HP Motor  | 8   | Nos. |          | 10,000.00 | -                | 80,000.00        |
|       | ii      | Fan Starter Panel for 7.5 HP Motor  | 4   | Nos. |          | 10,000.00 | -                | 40,000.00        |
|       | iii     | Fan Starter Panel for 10 HP Motor   | -   | Nos. |          | 10,000.00 | -                | -                |
|       | iv      | Fan Starter Panel for 3 HP Motor  | -   | Nos. |          | 10,000.00 | -                | -                |
|       | v       | Fan Starter Panel for 2 HP Motor  | -   | Nos. |          | 10,000.00 | -                | -                |
|       | vi      | Fan Starter Panel for 1.5 HP Motor  | -   | Nos. |          | 10,000.00 | -                | -                |
|       | vii     | Fan Starter Panel for 1 HP Motor  | -   | Nos. |          | 10,000.00 | -                | -                |
| 1.16  | NSR     | BASEMENT VENTILATION FAN PANEL  |     |      |          |           |                  |                  |
|       |         | IP Rating : IP42  |     |      |          |           |                  |                  |
|       |         | Incomer:  |     |      |          |           |                  |                  |
|       |         | • 1 No. 200 A 3P, MCCB, 25 KA of suitable rating as per load.   |     |      |          |           |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |           |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |           |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |           |                  |                  |
|       |         | Incomer Indications:  |     |      |          |           |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |           |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |           |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |           |                  |                  |
|       |         | Incomer Metering:   |     |      |          |           |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 250 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.  |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |          |                  |                  |
|       |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|       |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, centre tap earthed.   |     |      |          |          |                  |                  |
|       |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |          |                  |                  |
|       |         | • 110V control bus.  |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer. |     |      |          |            |                  |                  |
|        |         | Outgoings  |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 3 Nos. 3.75 KW supply air fan.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 2.2 KW supply air fan.  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 1.5 KW supply air fan.  |     |      |          |            |                  |                  |
|        |         | • 3 Nos. 3.75 KW exhaust air fan.  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 2.2 KW exhaust air fan.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 1.5 KW exhaust air fan.   |     |      |          |            |                  |                  |
|        |         | • 3 Nos. 1.1 KW fan  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 5.5 KW fan.   |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 0.6 KW pump.  |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 3.75 KW   |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 2.2 KW  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 1.5 KW  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 1.1 KW  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 5.5 KW  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 0.6 KW  |     |      |          |            |                  |                  |
|        |         | Star Delta Starter Feeders for:  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 22.5 KW scruber   |     |      |          |            |                  |                  |
|        |         | • 2. No. 11 Kw air washer  |     |      |          |            |                  |                  |
|        |         | Spare Star Delta Starter Feeders:  |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 22.5 KW scruber   |     |      |          |            |                  |                  |
|        |         | • 1. No. 11 Kw air washer  |     |      |          |            |                  |                  |
|        |         | • MPCB shall be with inbuilt S/C release.  |     |      |          |            |                  |                  |
|        |         | • MPCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|        |         | • ON / OFF / TRIP Indication lamps LED type 110 V.   |     |      |          |            |                  |                  |
|        |         | • Digital Ammeter.   |     |      |          |            |                  |                  |
|        |         | • 3 Nos. metering Class 1 accuracy cast resin CT's of suitable ratio & burden.   |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.                        |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.                             |     |      |          |            |                  |                  |
|        |         | Basement Ventilation Fan Panel as described above.   | 1   | Set  |          | 275,000.00 | -                | 275,000.00       |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
| 1.17  | NSR     | SMOKE VENTING PANEL-1 & 2 (IPD Block)   |     |      |          |          |                  |                  |
|       |         | IP Rating : IP-65   |     |      |          |          |                  |                  |
|       |         | Incomer:  |     |      |          |          |                  |                  |
|       |         | • 1 No.400 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications:  |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:   |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)   |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 600 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at ± 2.5%, ±5%, 50HZ, center tap earthed.  |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 7 Nos. 7.5 KW for smoke exhaust/fresh air fan.   |     |      |          |            |                  |                  |
|        |         | • 5 Nos. 5.5 KW for smoke exhaust/fresh air fan.   |     |      |          |            |                  |                  |
|        |         | • 5 Nos. 3.75 KW for smoke exhaust/fresh air fan.  |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 7.5 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 5.5KW motor.  |     |      |          |            |                  |                  |
|        |         | • 2 No. 3.75KW motor.  |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Smoke Venting Panel -1&2 (IPD Block) as described above.   | 2   | Set  |          | 375,000.00 | -                | 750,000.00       |
| 1.18   | NSR     | CHILLER PANEL  |     |      |          |            |                  |                  |
|        |         | Section-1:   |     |      |          |            |                  |                  |
|        |         | Incomer-1:   |     |      |          |            |                  |                  |
|        |         | 1 No., 3200 A, 50 kA, TP, EDO, ACB with:   |     |      |          |            |                  |                  |
| i.     |         | 230V, AC spring charging motor   |     |      |          |            |                  |                  |
| ii.    |         | 230V, AC closing coil  |     |      |          |            |                  |                  |
| iii.   |         | 24V, DC shunt trip coil  |     |      |          |            |                  |                  |
| iv.    |         | 4 NO + 4NC Aux. contacts   |     |      |          |            |                  |                  |
| v.     |         | In built trip LED's  |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
| vi.   |         | Breaker control switch   |     |      |          |          |                  |                  |
|       |         | Protection:  |     |      |          |          |                  |                  |
| i.    |         | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |          |                  |                  |
| ii.   |         | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |          |                  |                  |
|       |         | Metering & Indications   |     |      |          |          |                  |                  |
| i.    |         | R, Y, B LED indications (110V)   |     |      |          |          |                  |                  |
| ii.   |         | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |          |                  |                  |
| iii.  |         | Trip circuit healthy indications (24V DC)  |     |      |          |          |                  |                  |
| iv.   |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.    |         | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |          |                  |                  |
| vi.   |         | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |          |                  |                  |
| vii.  |         | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | 4000 A, TP, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|       |         | Out goings :   |     |      |          |          |                  |                  |
|       |         | 2 Nos. 1600 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | For Each ACB OUTGOING:   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:  |     |      |          |          |                  |                  |
|       |         | A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH   |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A, 50 KA, TP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 1 No. 250 A, 50 KA, TP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Spares:  |     |      |          |          |                  |                  |
|       |         | 1 Nos. 1600 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC). |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A, 50 KA, TP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | 1 No. 250 A, 50 KA, TP MCCB with fixed thermal & fixed magnetic releases, upto 250A & beyond microprocessor based releases with KWH meter with RS-485 Port With ON/Off/trip indication lamps.  |     |      |          |          |                  |                  |
|       |         | Bus Coupler - 1:   |     |      |          |          |                  |                  |
|       |         | Between Section 1 & 2:   |     |      |          |          |                  |                  |
|       |         | 1 No. 3200A, 50KA, 4P, EDO ACB with:   |     |      |          |          |                  |                  |
| i.    |         | 230V AC spring charging motor  |     |      |          |          |                  |                  |
| ii.   |         | 230V AC closing coil   |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.   |         | 4NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
|       |         | Indications  |     |      |          |          |                  |                  |
|       |         | ON, OFF LED indications (24V DC)   |     |      |          |          |                  |                  |
|       |         | Section-2:   |     |      |          |          |                  |                  |
|       |         | Incomer-2:   |     |      |          |          |                  |                  |
|       |         | 1 No., 3200 A, 50 kA, TP, EDO, ACB with:   |     |      |          |          |                  |                  |
| i.    |         | 230V, AC spring charging motor   |     |      |          |          |                  |                  |
| ii.   |         | 230V, AC closing coil  |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.   |         | 4 NO + 4NC Aux. contacts   |     |      |          |          |                  |                  |
| v.    |         | In built trip LED's  |     |      |          |          |                  |                  |
| vi.   |         | Breaker control switch   |     |      |          |          |                  |                  |
|       |         | Protection:  |     |      |          |          |                  |                  |
| i.    |         | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |          |                  |                  |
| ii.   |         | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |          |                  |                  |
|       |         | Metering & Indications   |     |      |          |          |                  |                  |
| i.    |         | R, Y, B LED indications (110V)   |     |      |          |          |                  |                  |
| ii.   |         | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
| iii.  |         | Trip circuit healthy indications (24V DC)  |     |      |          |          |                  |                  |
| iv.   |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.    |         | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |          |                  |                  |
| vi.   |         | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |          |                  |                  |
| vii.  |         | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | 4000 A, TP, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|       |         | Out goings :   |     |      |          |          |                  |                  |
|       |         | 2 Nos. 1600 A 50 kA, TP <u>MDO ACB</u> with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 1 Nos. 1250 A 50 kA, TP <u>MDO ACB</u> with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | Spares:  |     |      |          |          |                  |                  |
|       |         | 1 Nos. 1600 A 50 kA, TP <u>MDO ACB</u> with 4NO + 4NC Auxiliary contacts, with <u>inbuilt Micro Processor based releases</u> (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | 1 Nos. 1250 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).   |     |      |          |          |                  |                  |
|       |         | Bus Coupler - 2:<br>Between Section 2 & 3:   |     |      |          |          |                  |                  |
|       |         | 1 No. 3200A, 50KA, 4P, EDO ACB with:   |     |      |          |          |                  |                  |
| i.    |         | 230V AC spring charging motor  |     |      |          |          |                  |                  |
| ii.   |         | 230V AC closing coil   |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.   |         | 4NO + 4NC Aux. contacts  |     |      |          |          |                  |                  |
|       |         | Indications<br>ON, OFF LED indications (24V DC)  |     |      |          |          |                  |                  |
|       |         | Section-3:<br>Incomer-3:   |     |      |          |          |                  |                  |
|       |         | 1 No., 3200 A, 50 kA, TP, EDO, ACB with:   |     |      |          |          |                  |                  |
| i.    |         | 230V, AC spring charging motor   |     |      |          |          |                  |                  |
| ii.   |         | 230V, AC closing coil  |     |      |          |          |                  |                  |
| iii.  |         | 24V, DC shunt trip coil  |     |      |          |          |                  |                  |
| iv.   |         | 4 NO + 4NC Aux. contacts   |     |      |          |          |                  |                  |
| v.    |         | In built trip LED's  |     |      |          |          |                  |                  |
| vi.   |         | Breaker control switch   |     |      |          |          |                  |                  |
|       |         | Protection:  |     |      |          |          |                  |                  |
| i.    |         | In built micro processor based releases (O/C, S/C & E/F).  |     |      |          |          |                  |                  |
| ii.   |         | Restricted earth fault relay with 4 Nos. PS class cast resin CT's of suitable burden & ratio (1 No. at transformer & 3 Nos. at ACB incomer)  |     |      |          |          |                  |                  |
|       |         | Metering & Indications   |     |      |          |          |                  |                  |
| i.    |         | R, Y, B LED indications (110V)   |     |      |          |          |                  |                  |
| ii.   |         | ON, OFF, TRIP LED indications (24V DC)   |     |      |          |          |                  |                  |
| iii.  |         | Trip circuit healthy indications (24V DC)  |     |      |          |          |                  |                  |
| iv.   |         | 415V / $\sqrt{3}$ / 110V/ $\sqrt{3}$ PT's, Cast Resin type, 3 Phase for metering & indications, suitable rated 6A, TP MPCB of the fault withstand capacity as of the panel on the primary side of PT & suitable rated 6A, TP MCB on the secondary side of PT. This metering PT shall be of Class-1 accuracy. |     |      |          |          |                  |                  |
| v.    |         | 3 Nos. cast resin class 1 metering CT's of adequate burden & ratio.  |     |      |          |          |                  |                  |
| vi.   |         | MFM meter (with RS 485 port) with following parameter: A,V, PF, Hz, KW, KWH, KVA, KVAR, KVARH. (110V AC).  |     |      |          |          |                  |                  |
| vii.  |         | 3 Nos. Cast resin Class 1 CT's of adequate burden & ratio for automatic power factor capacitor relay.  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | 4000 A, TP, Aluminium Bus bars of Electrolytic grade with heat shrinkable sleeves 50 KA. Bus bar rated for 50 deg. C temp. rise over the ambient temperature of 40 deg. C (for all indoor panels)  |     |      |          |          |                  |                  |
|       |         | Out goings :   |     |      |          |          |                  |                  |
|       |         | 1 No. 1600 A 50 kA, TP <u>MDO</u> <u>ACB</u> with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 1 Nos. 1250 A 50 kA, TP <u>MDO</u> <u>ACB</u> with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC). |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 1 No. 630 A 50 kA, TP <u>MDO</u> <u>ACB</u> with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).   |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | 3 Nos. 250 A 50 kA, TP <u>MDO</u> <u>ACB</u> with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |          |                  |                  |
|       |         | 1 No. Digital Multi Function Meter (110V) (With RS 485 Port) with following parameters:<br>A,V, PF, Hz, KW, KWH, KVA, KVAH, KVAR, KVARH  |     |      |          |          |                  |                  |
|       |         | Spares:  |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate     | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|--------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6            | 6                | 8                |
|       |         | 1 Nos. 1600 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC). |     |      |          |              |                  |                  |
|       |         | 1 Nos. 630 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |              |                  |                  |
|       |         | 1 Nos. 250 A 50 kA, TP MDO ACB with 4NO + 4NC Auxiliary contacts, with inbuilt Micro Processor based releases (O/C, S/C, E/F), inbuilt trip LED, 3 Nos. Class-1 Cast Resin metering CT's of suitable ratio & burden, ON/OFF LED indications (24V DC).  |     |      |          |              |                  |                  |
|       |         | CHILLER PANEL as described above   | 1   |      |          | 3,040,000.00 | -                | 3,040,000.00     |
|       |         | FOR ACADEMIC BLOCK & DHARAMSHALA   |     |      |          |              |                  |                  |
| 1.19  | NSR     | AHU PANEL- AUDITORIUM  |     |      |          |              |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |              |                  |                  |
|       |         | Incomer :  |     |      |          |              |                  |                  |
|       |         | • 1 No. 160 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |              |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |              |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |              |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |              |                  |                  |
|       |         | Incomer Indications :  |     |      |          |              |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |              |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |              |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |              |                  |                  |
|       |         | Incomer Metering :   |     |      |          |              |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |              |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |              |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |              |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |              |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |              |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |              |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 200 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.1 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 6 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|       |         | Spares:   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 No. suitable rated 25 KA, 3P, MPCB suitable for 1.1 KW AHU motor.                             |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| Notes: |         |  |     |      |          |            |                  |                  |
| 1      |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2      |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3      |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4      |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5      |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6      |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.     |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.     |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|        |         | AHU Panel- Auditorium as described above.  | 1   | Set  |          | 110,000.00 | -                | 110,000.00       |
| 1.20   | NSR     | AHU PANEL-ADMIN. & LIBRARY   |     |      |          |            |                  |                  |
|        |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|        |         | Incomer :  |     |      |          |            |                  |                  |
|        |         | • 1 No.160 A 3P, MCCB, 25KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|        |         | Incomer Indications :  |     |      |          |            |                  |                  |
|        |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|        |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|        |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|        |         | Incomer Metering :   |     |      |          |            |                  |                  |
|        |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|        |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|        |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|        |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|        |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|        |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|        |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 200 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.         |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 5 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 8 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 0.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|       |         | Spares:   |     |      |          |          |                  |                  |
|       |         | •1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                             |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 0.75 KW AHU motor.                           |     |      |          |          |                  |                  |



| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| Notes: |         |  |     |      |          |            |                  |                  |
| 1      |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2      |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3      |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4      |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5      |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6      |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.     |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.     |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|        |         | AHU Panel-Admin & Library as described above.  | 1   | Set  |          | 110,000.00 | -                | 110,000.00       |
| 1.21   | NSR     | AHU PANEL-MEDICAL COLLEGE  |     |      |          |            |                  |                  |
|        |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|        |         | Incomer :  |     |      |          |            |                  |                  |
|        |         | • 1 No. 125 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|        |         | Incomer Indications :  |     |      |          |            |                  |                  |
|        |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|        |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|        |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|        |         | Incomer Metering :   |     |      |          |            |                  |                  |
|        |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|        |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|        |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|        |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|        |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|        |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|        |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Protection for metering PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 200 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.  |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Outgoings :  |     |      |          |          |                  |                  |
|       |         | • 9 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 5 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | Spares:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.2 KW AHU motor.   |     |      |          |          |                  |                  |
|       |         | Notes:   |     |      |          |          |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |          |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |          |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |          |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |          |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |          |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |          |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |          |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | AHU Panel-Medical College as described above.   | 1   | Set  |          | 110,000.00 | -                | 110,000.00       |
| 1.22  | NSR     | AHU PANEL-Medical Lab   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65   |     |      |          |            |                  |                  |
|       |         | Incomer :   |     |      |          |            |                  |                  |
|       |         | • 1 No. 200 A 3P, MCCB, 25KA of suitable rating as per load.                              |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                    |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                               |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                     |     |      |          |            |                  |                  |
|       |         | Incomer Indications :   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |            |                  |                  |
|       |         | Incomer Metering :  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                 |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.             |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |            |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.            |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.                                      |     |      |          |            |                  |                  |
|       |         | Bus Bars:   |     |      |          |            |                  |                  |
|       |         | • 250 A, 3P, 25KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves. |     |      |          |            |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |            |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel-Medical Lab as described above.  | 1   | Set  |          | 215,000.00 | -                | 215,000.00       |
| 1.23  | NSR     | AHU PANEL- Shared Lab  |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No.125 A 3P, MCCB, 25KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|       |         | Incomer Indications :  |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering :   |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for metering PT:  |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|        |         | Bus Bars:   |     |      |          |          |                  |                  |
|        |         | • 200 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|        |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|        |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|        |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|        |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|        |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|        |         | Outgoings :   |     |      |          |          |                  |                  |
|        |         | •2 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                              |     |      |          |          |                  |                  |
|        |         | •3 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                              |     |      |          |          |                  |                  |
|        |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|        |         | • 7 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.20 KW AHU motor.                           |     |      |          |          |                  |                  |
|        |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.                            |     |      |          |          |                  |                  |
|        |         | Spares:   |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.                              |     |      |          |          |                  |                  |
|        |         | •1 No. suitable rated 25 KA, 3P, MPCB suitable for 5.5 KW AHU motor.                              |     |      |          |          |                  |                  |
|        |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.                           |     |      |          |          |                  |                  |
|        |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.20 KW AHU motor.                           |     |      |          |          |                  |                  |
|        |         | • 1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 1.5 KW AHU motor.                            |     |      |          |          |                  |                  |
| Notes: |         |   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |            |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |            |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |            |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |            |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |            |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |            |                  |                  |
|       |         | AHU Panel- Medical Shred Lab as described above.   | 1   | Set  |          | 215,000.00 | -                | 215,000.00       |
| 1.24  | NSR     | AHU PANEL- Nursing College   |     |      |          |            |                  |                  |
|       |         | IP Rating : IP-65  |     |      |          |            |                  |                  |
|       |         | Incomer :  |     |      |          |            |                  |                  |
|       |         | • 1 No. 100 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|       |         | Incomer Indications :  |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering :   |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Protection for metering PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 150 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.   |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Outgoings :  |     |      |          |          |                  |                  |
|       |         | • 8 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 2.20 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | Spares:  |     |      |          |          |                  |                  |
|       |         | •1 Nos. suitable rated 25 KA, 3P, MPCB suitable for 7.5 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 3.75 KW AHU motor.  |     |      |          |          |                  |                  |
|       |         | Notes:   |     |      |          |          |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |          |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |          |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |          |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |          |                  |                  |
| 5     |         | Indication lamps shall be LED type (110V)  |     |      |          |          |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:   |     |      |          |          |                  |                  |
| a.    |         | Digital Ammeter.   |     |      |          |          |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |          |                  |                  |



| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | AHU Panel- Medical Shred Lab as described above.   | 1   | Set  |          | 110,000.00 | -                | 110,000.00       |
| 1.25  | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL AUDITORIUM                              |     |      |          |            |                  |                  |
|       |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|       |         | Incomer:   |     |      |          |            |                  |                  |
|       |         | • 1 No. 250A,3P, MCCB, 25 KA of suitable rating as per load.                               |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                     |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                      |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.              |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.             |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.                                       |     |      |          |            |                  |                  |
|       |         | Bus Bars:  |     |      |          |            |                  |                  |
|       |         | • 300 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves. |     |      |          |            |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |          |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|        |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |          |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |          |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|        |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.   |     |      |          |          |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |          |                  |                  |
|        |         | • 110V control bus.  |     |      |          |          |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |          |                  |                  |
|        |         | Outgoings:   |     |      |          |          |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |          |                  |                  |
|        |         | • 2 Nos. 7.5 KW stair case Pr. Fan.  |     |      |          |          |                  |                  |
|        |         | • 2 Nos. 5.5 KW lift well Pr. fan.   |     |      |          |          |                  |                  |
|        |         | • 8 Nos. 7.5 KW for smoke exhaust fan.   |     |      |          |          |                  |                  |
|        |         | • 4 Nos. 1.5 KW for smoke exhaust fan.   |     |      |          |          |                  |                  |
|        |         | Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|        |         | • 2 Nos. 11.0 KW for smoke exhaust fan.  |     |      |          |          |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |          |                  |                  |
|        |         | • 1 Nos. 7.5 KW motor.   |     |      |          |          |                  |                  |
|        |         | • 1 No. 1.5 KW motor.  |     |      |          |          |                  |                  |
|        |         | Spare Star Delta Starter Feeders for:  |     |      |          |          |                  |                  |
|        |         | • 1 Nos. 11.0 KW motor.  |     |      |          |          |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |          |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|       |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Auditorium as described above.        | 1   | Set  |          | 264,000.00 | -                | 264,000.00       |
| 1.26  | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL LIBRARY & ADMIN.                        |     |      |          |            |                  |                  |
|       |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|       |         | Incomer:   |     |      |          |            |                  |                  |
|       |         | • 1 No. 125 A 3P, MCCB, 25 KA of suitable rating as per load.                              |     |      |          |            |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                     |     |      |          |            |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                |     |      |          |            |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                      |     |      |          |            |                  |                  |
|       |         | Incomer Indications:   |     |      |          |            |                  |                  |
|       |         | • R,Y,B phase indication lamps   |     |      |          |            |                  |                  |
|       |         | • ON/OFF, Trip indication lamps  |     |      |          |            |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)  |     |      |          |            |                  |                  |
|       |         | Incomer Metering:  |     |      |          |            |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |            |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |            |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |            |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |            |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                  |     |      |          |            |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |            |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.              |     |      |          |            |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |            |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.             |     |      |          |            |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.                                       |     |      |          |            |                  |                  |
|       |         | Bus Bars:  |     |      |          |            |                  |                  |
|       |         | • 150 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves. |     |      |          |            |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |            |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |            |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |            |                  |                  |
|        |         | • PT shall be cast resin type.   |     |      |          |            |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |            |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |            |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |            |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.   |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 7.5 KW lift well Pr. fan.   |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 5.5 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 3.75 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 2.2 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 1.5 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 1 Nos. 7.5 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 3.75 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 2.2 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 1.5 KW motor.  |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Library & Admin as described above.   | 1   | Set  |          | 134,000.00 | -                | 134,000.00       |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
| 1.27  | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL<br>MEDICAL COLLEGE                             |     |      |          |          |                  |                  |
|       |         | IP Rating : IP 65   |     |      |          |          |                  |                  |
|       |         | Incomer:  |     |      |          |          |                  |                  |
|       |         | • 1 No. 63 A 3P, MCCB, 25 KA of suitable rating as per load.                                      |     |      |          |          |                  |                  |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications:  |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:   |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)   |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 100 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|        |         | • PT shall be cast resin type.   |     |      |          |           |                  |                  |
|        |         | • PT shall be of suitable burden (VA).   |     |      |          |           |                  |                  |
|        |         | Protection for Bus PT:   |     |      |          |           |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |           |                  |                  |
|        |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |           |                  |                  |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |           |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |           |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |           |                  |                  |
|        |         | • Transformer with primary taps at ± 2.5%, ±5%, 50HZ, center tap earthed.  |     |      |          |           |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |           |                  |                  |
|        |         | • 110V control bus.  |     |      |          |           |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |           |                  |                  |
|        |         | Outgoings:   |     |      |          |           |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |           |                  |                  |
|        |         | • 2 Nos. 5.5 KW lift well Pr. fan.   |     |      |          |           |                  |                  |
|        |         | • 6 Nos. 1.1 KW for smoke exhaust fan.   |     |      |          |           |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |           |                  |                  |
|        |         | • 1 No. 5.5 KW motor.  |     |      |          |           |                  |                  |
|        |         | • 1 No. 1.1 KW motor.  |     |      |          |           |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |           |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |           |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Medical College as described above.   | 1   | Set  |          | 65,000.00 | -                | 65,000.00        |
| 1.28   | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL MEDICAL LAB   |     |      |          |           |                  |                  |
|        |         | IP Rating : IP 65  |     |      |          |           |                  |                  |
|        |         | Incomer:   |     |      |          |           |                  |                  |
|        |         | • 1 No. 100 A 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |           |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications:  |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:   |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)   |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 150 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.   |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 5.5 KW lift well Pr. fan.   |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 3.75 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 2.2 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | • 12 Nos. 1.1 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 1 No. 5.5 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 3.75 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 2.2. KW motor.   |     |      |          |            |                  |                  |
|        |         | • 2 No. 1.1 KW motor.  |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Medical Lab as described above.   | 1   | Set  |          | 120,000.00 | -                | 120,000.00       |
| 1.29   | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL NURSING COLLEGE   |     |      |          |            |                  |                  |
|        |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|        |         | Incomer:   |     |      |          |            |                  |                  |
|        |         | • 1 No. 100 A 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |



| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | Incomer Indications:  |     |      |          |          |                  |                  |
|       |         | • R,Y,B phase indication lamps  |     |      |          |          |                  |                  |
|       |         | • ON/OFF, Trip indication lamps   |     |      |          |          |                  |                  |
|       |         | • Indication lamps shall be LED type (110V)   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:   |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter  |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:  |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)   |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 150 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:             |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |            |                  |                  |
|        |         | • Transformer to be of adequate burden.  |     |      |          |            |                  |                  |
|        |         | • Transformer with primary taps at ± 2.5%, ±5%, 50HZ, center tap earthed.  |     |      |          |            |                  |                  |
|        |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |            |                  |                  |
|        |         | • 110V control bus.  |     |      |          |            |                  |                  |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer.                             |     |      |          |            |                  |                  |
|        |         | Outgoings:   |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 5.5 KW lift well Pr. fan.   |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 3.75 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 2.2 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 1.1 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |            |                  |                  |
|        |         | • 1 No. 5.5 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 3.75 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 2.2 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 1.1 KW motor.  |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.  |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.   |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Nursing College as described above.   | 1   | Set  |          | 120,000.00 | -                | 120,000.00       |
| 1.30   | NSR     | STAIR CASE & LIFT WELL PR. FAN & SMOKE VENT. PANEL SHARED LAB  |     |      |          |            |                  |                  |
|        |         | IP Rating : IP 65  |     |      |          |            |                  |                  |
|        |         | Incomer:   |     |      |          |            |                  |                  |
|        |         | • 1 No. 125 A 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |            |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |            |                  |                  |
|        |         | Incomer Indications:   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | <ul style="list-style-type: none"> <li>• R,Y,B phase indication lamps</li> <li>• ON/OFF, Trip indication lamps</li> <li>• Indication lamps shall be LED type (110V)</li> </ul>   |     |      |          |          |                  |                  |
|       |         | Incomer Metering:  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• 1 No. combined Digital VAF meter</li> <li>• Meter shall be (110V) and communicable type.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• CT metering Class-1 accuracy CT's (one per phase)</li> <li>• CT shall be cast resin type &amp; shall be of suitable burden (VA) &amp; ratio.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• 415V / <math>\sqrt{3}</math> / 110V / <math>\sqrt{3}</math> PT for metering and indication lamps.</li> <li>• PT shall be Class-1 accuracy.</li> <li>• PT shall be cast resin type.</li> <li>• PT shall be of suitable burden (VA).</li> </ul>                     |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• TP MPCB of suitable rating &amp; fault withstand capacity on primary side of PT.</li> <li>• TP MCB of suitable rating on secondary side of PT.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• 150 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• 415V / <math>\sqrt{3}</math> / 110V / <math>\sqrt{3}</math> PT for metering and indication lamps of outgoing feeders.</li> <li>• PT shall be Class-1 accuracy.</li> <li>• PT shall be cast resin type.</li> <li>• PT shall be of suitable burden (VA).</li> </ul> |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• TP MPCB of suitable rating &amp; fault withstand capacity on primary side of PT.</li> <li>• TP MCB of suitable rating on secondary side of PT.</li> </ul>   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |          |                  |                  |
|       |         | <ul style="list-style-type: none"> <li>• 2 Nos. 415V / 55-0-55 V, cast resin control transformer.</li> <li>• Transformer to be of adequate burden.</li> <li>• Transformer with primary taps at <math>\pm 2.5\%</math>, <math>\pm 5\%</math>, 50HZ, center tap earthed.</li> </ul>                          |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|--------|---------|---|-----|------|----------|------------|------------------|------------------|
| 1      | 1A      | 2   | 3   | 4    | 5        | 6          | 6                | 8                |
|        |         | <ul style="list-style-type: none"> <li>• Auto change over circuiting &amp; mechanism for fool proof auto &amp; manual change over from one transformer to 2nd transformer incase of one going faulty.</li> <li>• 110V control bus.</li> </ul> |     |      |          |            |                  |                  |
|        |         | <ul style="list-style-type: none"> <li>• TP MPCB of suitable rating &amp; fault withstand capacity at Primary side &amp; DP MCB at secondary side of control transformer.</li> </ul>  |     |      |          |            |                  |                  |
|        |         | Outgoings:  |     |      |          |            |                  |                  |
|        |         | DOL Starter Feeders for:  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 5.5 KW lift well Pr. fan.  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 3.75 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | • 4 Nos. 2.2 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | • 2 Nos. 1.5 KW for smoke exhaust fan.  |     |      |          |            |                  |                  |
|        |         | • 10 Nos. 1.1 KW for smoke exhaust fan.   |     |      |          |            |                  |                  |
|        |         | Spare DOL Starter Feeders for:  |     |      |          |            |                  |                  |
|        |         | • 1 No. 5.5 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 1 No. 3.75 KW motor.  |     |      |          |            |                  |                  |
|        |         | • 1 No. 1.5 KW motor.   |     |      |          |            |                  |                  |
|        |         | • 2 No. 1.1 KW motor.   |     |      |          |            |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.   |     |      |          |            |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.  |     |      |          |            |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan & Smoke Vent. Panel - Shared Labs as described above.  | 1   | Set  |          | 132,000.00 | -                | 132,000.00       |
| 1.31   | NSR     | STAIR CASE & LIFT WELL PR. FAN PANEL - DHARAMSHALA  |     |      |          |            |                  |                  |
|        |         | IP Rating : IP 65   |     |      |          |            |                  |                  |
|        |         | Incomer:  |     |      |          |            |                  |                  |
|        |         | • 1 No. 63 A 3P, MCCB, 25 KA of suitable rating as per load.  |     |      |          |            |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.  |     |      |          |            |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.   |     |      |          |            |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.   |     |      |          |            |                  |                  |
|        |         | Incomer Indications:  |     |      |          |            |                  |                  |
|        |         | • R,Y,B phase indication lamps  |     |      |          |            |                  |                  |
|        |         | • ON/OFF, Trip indication lamps   |     |      |          |            |                  |                  |
|        |         | • Indication lamps shall be LED type (110V)   |     |      |          |            |                  |                  |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | Incomer Metering:  |     |      |          |          |                  |                  |
|       |         | • 1 No. combined Digital VAF meter   |     |      |          |          |                  |                  |
|       |         | • Meter shall be (110V) and communicable type.   |     |      |          |          |                  |                  |
|       |         | Incomer Metering CT:   |     |      |          |          |                  |                  |
|       |         | • CT metering Class-1 accuracy CT's (one per phase)  |     |      |          |          |                  |                  |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:   |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Metering PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | Bus Bars:  |     |      |          |          |                  |                  |
|       |         | • 100 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.   |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoings:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders.  |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.  |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.   |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).   |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.   |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.   |     |      |          |          |                  |                  |
|       |         | 110V Control Transformer for Contactor Coils / Starters & out going Indication lamps:  |     |      |          |          |                  |                  |
|       |         | • 2 Nos. 415V / 55-0-55 V, cast resin control transformer.   |     |      |          |          |                  |                  |
|       |         | • Transformer to be of adequate burden.  |     |      |          |          |                  |                  |
|       |         | • Transformer with primary taps at $\pm 2.5\%$ , $\pm 5\%$ , 50HZ, center tap earthed.   |     |      |          |          |                  |                  |
|       |         | • Auto change over circuiting & mechanism for fool proof auto & manual change over from one transformer to 2nd transformer incase of one going faulty. |     |      |          |          |                  |                  |
|       |         | • 110V control bus.  |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|        |         | • TP MPCB of suitable rating & fault withstand capacity at Primary side & DP MCB at secondary side of control transformer. |     |      |          |           |                  |                  |
|        |         | Outgoings:   |     |      |          |           |                  |                  |
|        |         | DOL Starter Feeders for:   |     |      |          |           |                  |                  |
|        |         | • 3 Nos. 5 HP Lift well Pr. Fan.   |     |      |          |           |                  |                  |
|        |         | Spare DOL Starter Feeders for:   |     |      |          |           |                  |                  |
|        |         | • 1 Nos. 5 HP Lift well Pr. Fan.   |     |      |          |           |                  |                  |
| Notes: |         | 1. All outgoing feeders & bus bars shall be of same fault with stand capacity as of incomer switch.                        |     |      |          |           |                  |                  |
|        |         | 2. All starter / VFD feeders equipment, metering & indications as per specifications attached.                             |     |      |          |           |                  |                  |
|        |         | Stair Case & Lift Well Pr. Fan Panel Panel as described above.   | 1   | Set  |          | 60,000.00 | -                | 60,000.00        |
| 1.32   | NSR     | KITCHEN VENTILATION PANEL - DHARAMSHALA  |     |      |          |           |                  |                  |
|        |         | IP Rating : IP 65  |     |      |          |           |                  |                  |
|        |         | Incomer :  |     |      |          |           |                  |                  |
|        |         | • 1 No. 63 A 3P, MCCB, 25KA of suitable rating as per load.  |     |      |          |           |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |           |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |           |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |           |                  |                  |
|        |         | Incomer Indications :  |     |      |          |           |                  |                  |
|        |         | • R,Y,B phase indication lamps   |     |      |          |           |                  |                  |
|        |         | • ON/OFF, Trip indication lamps  |     |      |          |           |                  |                  |
|        |         | • Indication lamps shall be LED type (110V)  |     |      |          |           |                  |                  |
|        |         | Incomer Metering :   |     |      |          |           |                  |                  |
|        |         | • 1 No. combined Digital VAF meter   |     |      |          |           |                  |                  |
|        |         | • Meter shall be (110V) and communicable type.   |     |      |          |           |                  |                  |
|        |         | Incomer Metering CT:   |     |      |          |           |                  |                  |
|        |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |           |                  |                  |
|        |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.  |     |      |          |           |                  |                  |
|        |         | Incomer Metering PT:   |     |      |          |           |                  |                  |
|        |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.  |     |      |          |           |                  |                  |
|        |         | • PT shall be Class-1 accuracy.  |     |      |          |           |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 100 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | Feeder for Kitchen Scruber with VFD (without starter):11 KW Each -1 Nos.                          |     |      |          |          |                  |                  |
|       |         | • 1 No. 3P, MPCB, 25 KA of suitable rating as per load for secondary pumps VFD panel.             |     |      |          |          |                  |                  |
|       |         | Feeder for KitchenAir Washer with VFD (without starter):5.5 KW Each -1 Nos.                       |     |      |          |          |                  |                  |
|       |         | • 1 No. 3P, MPCB, 25 KA of suitable rating as per load for secondary pumps VFD panel.             |     |      |          |          |                  |                  |
|       |         | Spare Feeder similar to above (without starter): 2 Nos.   |     |      |          |          |                  |                  |
|       |         | • 1 No. 3P, MPCB, 25 KA of suitable rating .  |     |      |          |          |                  |                  |
|       |         | • MPCB shall be with inbuilt micro-processor based O/C & S/C releases.                            |     |      |          |          |                  |                  |
|       |         | • Both the releases shall be with adjustable trip settings.                                       |     |      |          |          |                  |                  |
|       |         | • MPCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.                             |     |      |          |          |                  |                  |
|       |         | • ON / OFF / TRIP Indication lamps LED type 110 V.  |     |      |          |          |                  |                  |
|       |         | • Digital Ammeter.  |     |      |          |          |                  |                  |
|       |         | • 3 Nos. metering Class 1 accuracy cast resin CT's of suitable ratio & burden.                    |     |      |          |          |                  |                  |

| S No.  | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|--------|---------|--|-----|------|----------|-----------|------------------|------------------|
| 1      | 1A      | 2  | 3   | 4    | 5        | 6         | 6                | 8                |
|        |         | DOL Starter Feeders for:<br>• 2 Nos. 1.1 KW Motor.   |     |      |          |           |                  |                  |
|        |         | Spare Starter Feeders for:<br>• 1 Nos. 1.1 KW Motor.   |     |      |          |           |                  |                  |
| Notes: |         |  |     |      |          |           |                  |                  |
| 1      |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.  |     |      |          |           |                  |                  |
| 2      |         | Each MPCB shall be with inbuilt S/C release.   |     |      |          |           |                  |                  |
| 3      |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.  |     |      |          |           |                  |                  |
| 4      |         | MPCB feeder shall have ON/OFF/TRIP indications.  |     |      |          |           |                  |                  |
| 5      |         | Indication lamps shall be LED type (110V)  |     |      |          |           |                  |                  |
| 6      |         | Each MPCB outgoing feeder to have:   |     |      |          |           |                  |                  |
| a.     |         | Digital Ammeter.   |     |      |          |           |                  |                  |
| b.     |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT). |     |      |          |           |                  |                  |
|        |         | Kitchen Ventilation Panel as described above.  | 1   | Set  |          | 60,000.00 | -                | 60,000.00        |
| 1.33   | NSR     | UPS and Server Room AC PANEL- IPD Block  |     |      |          |           |                  |                  |
|        |         | IP Rating : IP-65  |     |      |          |           |                  |                  |
|        |         | Incomer :  |     |      |          |           |                  |                  |
|        |         | • 1 No. 400 A 3P, MCCB, 25KA of suitable rating as per load.   |     |      |          |           |                  |                  |
|        |         | • MCCB shall be with inbuilt micro-processor based O/C & S/C releases.   |     |      |          |           |                  |                  |
|        |         | • Both the releases shall be with adjustable trip settings.  |     |      |          |           |                  |                  |
|        |         | • MCCB with 1NO + 1NC contacts and an auxiliary trip contact for BMS.  |     |      |          |           |                  |                  |
|        |         | Incomer Indications :  |     |      |          |           |                  |                  |
|        |         | • R,Y,B phase indication lamps   |     |      |          |           |                  |                  |
|        |         | • ON/OFF, Trip indication lamps  |     |      |          |           |                  |                  |
|        |         | • Indication lamps shall be LED type (110V)  |     |      |          |           |                  |                  |
|        |         | Incomer Metering :   |     |      |          |           |                  |                  |
|        |         | • 1 No. combined Digital VAF meter   |     |      |          |           |                  |                  |
|        |         | • Meter shall be (110V) and communicable type.   |     |      |          |           |                  |                  |
|        |         | Incomer Metering CT:   |     |      |          |           |                  |                  |
|        |         | • Metering Class-1 accuracy CT's (one per phase)   |     |      |          |           |                  |                  |



| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6        | 6                | 8                |
|       |         | • CT shall be cast resin type & shall be of suitable burden (VA) & ratio.                         |     |      |          |          |                  |                  |
|       |         | Incomer Metering PT:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps.                     |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for metering PT:   |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Bus Bars:   |     |      |          |          |                  |                  |
|       |         | • 600 A, 3P, 25 KA, Aluminium Bus Bars of electrolytic grade with heat shrinkable sleeves.        |     |      |          |          |                  |                  |
|       |         | Bus PT for outgoing:  |     |      |          |          |                  |                  |
|       |         | • 415V / $\sqrt{3}$ / 110V / $\sqrt{3}$ PT for metering and indication lamps of outgoing feeders. |     |      |          |          |                  |                  |
|       |         | • PT shall be Class-1 accuracy.   |     |      |          |          |                  |                  |
|       |         | • PT shall be cast resin type.  |     |      |          |          |                  |                  |
|       |         | • PT shall be of suitable burden (VA).  |     |      |          |          |                  |                  |
|       |         | Protection for Bus PT:  |     |      |          |          |                  |                  |
|       |         | • TP MPCB of suitable rating & fault withstand capacity on primary side of PT.                    |     |      |          |          |                  |                  |
|       |         | • TP MCB of suitable rating on secondary side of PT.  |     |      |          |          |                  |                  |
|       |         | Outgoings :   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 24 KW VRV.                                   |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 12 KW VRV.                                   |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 8 KW VRV.                                    |     |      |          |          |                  |                  |
|       |         | • 3 Nos. suitable rated 25 KA, 3P, MPCB suitable for 6 KW VRV.                                    |     |      |          |          |                  |                  |
|       |         | Spares:   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 24 KW VRV.                                   |     |      |          |          |                  |                  |
|       |         | • 2 Nos. suitable rated 25 KA, 3P, MPCB suitable for 8 KW VRV.                                    |     |      |          |          |                  |                  |
|       | Notes:  |   |     |      |          |          |                  |                  |
| 1     |         | All outgoing feeders & bus bars shall be same fault with stand capacity as of incomer switch.     |     |      |          |          |                  |                  |
| 2     |         | Each MPCB shall be with inbuilt S/C release.  |     |      |          |          |                  |                  |
| 3     |         | MPCB shall be with 1NO + 1NC contact and an auxiliary trip contact.                               |     |      |          |          |                  |                  |
| 4     |         | MPCB feeder shall have ON/OFF/TRIP indications.   |     |      |          |          |                  |                  |

| S No. | Code No | Item Description  | Qty | Unit | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|-------|---------|---|-----|------|----------|-----------|------------------|------------------|
| 1     | 1A      | 2   | 3   | 4    | 5        | 6         | 6                | 8                |
| 5     |         | Indication lamps shall be LED type (110V)   |     |      |          |           |                  |                  |
| 6     |         | Each MPCB outgoing feeder to have:  |     |      |          |           |                  |                  |
| a.    |         | Digital Ammeter.  |     |      |          |           |                  |                  |
| b.    |         | 3 Nos. or 1 No. metering Class 1 accuracy cast resin CT of suitable ratio & burden. (3 CT's above 5 HP / 3.7 KW motors & below 5 HP motors only 1 CT).  |     |      |          |           |                  |                  |
|       |         | UPS and Server Room AC PANEL- IPD Block as described above.   | 1   | Set  |          | 44,000.00 | -                | 44,000.00        |
| 2     | NSR     | STARTER PANEL - DOL / STAR DELTA STARTER  |     |      |          |           |                  |                  |
|       |         | Each Fan Starter Panel shall have :   |     |      |          |           |                  |                  |
|       | a.      | 14G CRCA Powder Coated panel enclosure with earthing studs & hinged locable doors. IP55 Protection, suitable for 415V, 3 Phase, 4 wire, 50Hz system.  |     |      |          |           |                  |                  |
|       | b.      | Type-II co-ordination switchgear.   |     |      |          |           |                  |                  |
|       | c.      | Incomer switch shall be TP MPCB of required rating & fault withstand capacity. MPCB shall be with overload & short circuit protection.  |     |      |          |           |                  |                  |
|       | d.      | R,Y,B LED Type Phase indication lamps with control MCB's.   |     |      |          |           |                  |                  |
|       | e.      | Auto / Manual Selector switch & ON & OFF Push buttons for manual operation & terminals for BMS wiring.  |     |      |          |           |                  |                  |
|       | f.      | ON' Indication LED Type lamp with control MCB.  |     |      |          |           |                  |                  |
|       | g.      | DOL Starter / Contactor for motors upto 10HP, with 2 NO + 2 NC Auxiliary contacts.  |     |      |          |           |                  |                  |
|       | h.      | Star-Delta starter / contactors / timers for motors beyond 10HP, with 2 NO + 2 NC Auxiliary contacts.   |     |      |          |           |                  |                  |
|       | i.      | All internal control & power wiring.  |     |      |          |           |                  |                  |
|       | j.      | Voltage operated 'SPP' (Single Phasing Preventor) for 10HP & above rating motors.   |     |      |          |           |                  |                  |
|       | k.      | Cast resin CT's (3 Nos. for more than 5HP motors) & single CT for motors upto 5HP for metering purposes. CT's shall be of required class & burden.  |     |      |          |           |                  |                  |
|       | l.      | *Digital VA Meter (BMS / Non BMS compatible).   |     |      |          |           |                  |                  |
|       | m.      | Control terminals / linkage / interlocking with fire detection system & fire dampers, so that Fresh air Fan motor trips on receiving a fire signal & normal & smoke exhaust fans start on receiving a fire signal. Manual control shall also be possible through an override. |     |      |          |           |                  |                  |
| 2.1   | i       | Fan Starter Panel for 5 HP Motor for Liftwell press fan   | 3   | Set  |          | 10,500.00 | -                | 31,500.00        |
| 2.1.1 |         | 7.5 HP DOL  | 12  | Set  |          | 10,500.00 |                  | 126,000.00       |
| 2.2.2 |         | 5 HP DOL  | 28  | Set  |          | 10,500.00 |                  | 294,000.00       |
| 2.2.3 |         | 3 HP DOL  | 37  | Set  |          | 8,750.00  |                  | 323,750.00       |
| 2.2.4 |         | 2 HP DOL  | 8   | Set  |          | 8,750.00  |                  | 70,000.00        |
| 2.2.5 |         | 1.5 HP DOL  | 4   | Set  |          | 8,750.00  |                  | 35,000.00        |
| 2.2.6 |         | 1 HP DOL  | 33  | Set  |          | 8,750.00  |                  | 288,750.00       |

| S No. | Code No | Item Description   | Qty | Unit | DSR Rate | NSR Rate   | Amount DSR Items | Amount NSR Items |
|-------|---------|--|-----|------|----------|------------|------------------|------------------|
| 1     | 1A      | 2  | 3   | 4    | 5        | 6          | 6                | 8                |
| 2.3   | NSR     | LOCAL FIELD STARTER  |     |      |          |            |                  |                  |
|       |         | Supply, Installation, testing & commissioning of DOL Starter in a weather proof, CRCA powder coated 14G Sheet steel box for Toilet Exhaust fans & Smoke exhaust & Fresh air fans, Pressurization fans, kitchen vent, fans. |     |      |          |            |                  |                  |
| 2.3.1 | NSR     | 3.75 KW for Toilet Fan.  | 5   | Set  |          | 8,750.00   | -                | 43,750.00        |
| 2.3.2 | NSR     | 2.20 KW for Toilet Fan.  | 6   | Set  |          | 8,750.00   | -                | 52,500.00        |
| 2.3.3 | NSR     | 20A, 3P  | 56  | Set  |          | 8,750.00   | -                | 490,000.00       |
| 2.3.4 | NSR     | 32A, 3P  | 23  | Set  |          | 8,750.00   | -                | 201,250.00       |
| 2.3.5 | NSR     | 40A, 3P  | 12  | Set  |          | 8,750.00   | -                | 105,000.00       |
| 2.3.6 | NSR     | 63A, 3P  | 3   | Set  |          | 8,750.00   | -                | 26,250.00        |
| 2.3.7 | NSR     | 32A, 3P  | 12  | Set  |          | 8,750.00   | -                | 105,000.00       |
|       |         |  |     |      |          |            |                  |                  |
| 3     | NSR     | VFD's for AHU/TFA, Basement's Normal Ventilation fans (S/A & E/A):   |     |      |          |            |                  |                  |
|       |         | IP 55 rated VFD with disconnect switch.  |     |      |          |            |                  |                  |
|       |         | VFD to have the following minimum features:  |     |      |          |            |                  |                  |
|       |         | ON/OFF/Run/Standby/Fault/Trip LCD display.   |     |      |          |            |                  |                  |
|       |         | To offer overload, short circuit & single phasing protection.  |     |      |          |            |                  |                  |
|       |         | THDI less than 5% & EMC/EMI interface level 'C1'.  |     |      |          |            |                  |                  |
|       |         | 2 Nos. DO, 4 Nos. DI, 2 Nos. AI, 1 No. AO & 2 Nos. Relay output contacts (or any other configuration as may be required).  |     |      |          |            |                  |                  |
|       |         | Display & metering of following minimum electrical parameters :  |     |      |          |            |                  |                  |
|       |         | I, V, Hz, KWH, KW, Run Time  |     |      |          |            |                  |                  |
|       |         | BMS compatible   |     |      |          |            |                  |                  |
|       |         | Interlocking with fire detection system i.e. to trip the motor on fire signal.   |     |      |          |            |                  |                  |
|       |         |  |     |      |          |            |                  |                  |
| 3.1   |         | VFD's For AHU, HRV FA, HRV EA Motors   |     |      |          |            |                  |                  |
| 3.1.1 | NSR     | 30 HP Motor  | 1   | Set  |          | 145,714.00 | -                | 145,714.00       |
| 3.1.2 | NSR     | 25 HP Motor  | 2   | Set  |          | 125,936.00 | -                | 251,872.00       |
| 3.1.3 | NSR     | 20 HP Motor  | 19  | Set  |          | 102,395.00 | -                | 1,945,505.00     |
| 3.1.4 | NSR     | 15 HP Motor  | 40  | Set  |          | 90,912.00  | -                | 3,636,480.00     |
| 3.1.5 | NSR     | 10 HP Motor  | 63  | Set  |          | 67,562.00  | -                | 4,256,406.00     |
| 3.1.6 | NSR     | 7.5 HP Motor   | 21  | Set  |          | 61,628.00  | -                | 1,294,188.00     |
| 3.1.7 | NSR     | 5 HP Motor   | 5   | Set  |          | 55,951.00  | -                | 279,755.00       |

| S No.   | Code No | Item Description   | Qty    | Unit  | DSR Rate | NSR Rate  | Amount DSR Items | Amount NSR Items |
|---------|---------|--|--------|-------|----------|-----------|------------------|------------------|
| 1       | 1A      | 2  | 3      | 4     | 5        | 6         | 6                | 8                |
| 3.1.8   | NSR     | 3 HP Motor   | 8      | Set   |          | 49,252.00 | -                | 394,016.00       |
| 3.1.9   | NSR     | 2 HP Motor   | 12     | Set   |          | 43,127.00 | -                | 517,524.00       |
| 3.1.10  | NSR     | 1.5 HP Motor   | 28     | Set   |          | 39,300.00 | -                | 1,100,400.00     |
| 3.1.11  | NSR     | 1.0 HP Motor   | 33     | Set   |          | 39,300.00 | -                | 1,296,900.00     |
| 3.2     |         | FOR ACADEMIC BLOCK   |        |       |          |           |                  |                  |
| 3.2.1   | NSR     | 11 KW Motor  | 1      | Set   |          | 90,912.00 | -                | 90,912.00        |
| 3.2.2   | NSR     | 7.5 KW Motor   | 3      | Set   |          | 67,562.00 | -                | 202,686.00       |
| 3.3     |         | Kitchen Scrubber & Air Washer  |        |       |          |           |                  |                  |
| 3.3.1   | NSR     | 15 HP Motor  | 1      | Set   |          | 90,912.00 | -                | 90,912.00        |
| 3.3.2   | NSR     | 7.5 HP Motor   | 1      | Set   |          | 61,628.00 | -                | 61,628.00        |
| 3.4     |         | LOCAL ISOLATORS  |        |       |          |           |                  |                  |
|         |         | Supply, Installation, testing & commissioning of 3 Pole, ON Load, AC23 duty isolator in a weather proof, CRCA powder coated 14G Sheet steel box for local isolation of Basement Ventilation fans, smoke venting fans, Staircase & Liftwell Pressurization Fans, Toilet Exhaust fan, Kitchen / Pantry Exhaust Fan & Cooling Tower Fan Motors: |        |       |          |           |                  |                  |
| 3.4.1   |         | For Ventilation Fan Motors :   |        |       |          |           |                  |                  |
| 3.4.1.1 | NSR     | 20A, 3P  | 55     | Nos.  |          | 2,308.00  | -                | 126,940.00       |
| 3.4.1.2 | NSR     | 32A, 3P  | 60     | Nos.  |          | 2,308.00  | -                | 138,480.00       |
| 3.4.1.3 | NSR     | 40A, 3P  | 24     | Nos.  |          | 2,362.00  | -                | 56,688.00        |
| 3.4.1.4 | NSR     | 63A, 3P  | 4      | Nos.  |          | 2,520.00  | -                | 10,080.00        |
| 3.4.1.5 | NSR     | 100A, 3P   | 4      | Nos.  |          | 2,637.00  | -                | 10,548.00        |
| 3.4.2   |         | For Cooling Tower Motors:  |        |       |          |           |                  |                  |
| 3.4.2.1 | NSR     | 32A, 3P  | 8      | Nos.  |          | 2,308.00  | -                | 18,464.00        |
| 3.4.2.2 | NSR     | 40A, 3P  | 20     | Nos.  |          | 2,362.00  | -                | 47,240.00        |
| 4       |         | MV CABLES, CABLE JOINTING & END TERMINATIONS   |        |       |          |           |                  |                  |
| 4.1     | 7.8     | Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 kV grade of following size on cable tray as required.   |        |       |          |           |                  |                  |
| 4.1.1   | 7.8.1   | Upto 35 sq. mm (clamped with 1mm thick saddle)   | 30,626 | Meter | 21       |           | 643,146.00       | -                |
| 4.1.1   | 7.8.2   | Above 35 sq. mm and upto 95 sq. mm (clamped with 25x3mm MS flat clamp)   | 981    | Meter | 49       |           | 48,069.00        | -                |
| 4.1.2   | 7.8.3   | Above 95 sq. mm and upto 185 sq. mm (clamped with 25/40x3mm MS flat clamp)   | 2,260  |       | 61       |           |                  |                  |
| 4.1.3   | 7.8.4   | Above 185 sq. mm and upto 400 sq. mm (clamped with 40x3mm MS flat clamp)   | 5,375  | Meter | 61       |           | 327,875.00       | -                |

| S No.  | Code No | Item Description   | Qty    | Unit  | DSR Rate | NSR Rate | Amount DSR Items | Amount NSR Items |
|--------|---------|--|--------|-------|----------|----------|------------------|------------------|
| 1      | 1A      | 2  | 3      | 4     | 5        | 6        | 6                | 8                |
| 5      | 9.1     | Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required.  |        |       |          |          |                  |                  |
| 5.1.1  | 9.1.19  | 3 C x 300 Sqmm   | 144    | Nos.  | 1,084    |          | 156,096.00       | -                |
| 5.1.2  | 9.1.14  | 3 C x 120 Sqmm   | 54     | Nos.  | 489      |          | 26,406.00        | -                |
| 5.1.3  | 9.1.13  | 3 C x 95 Sqmm  | 36     | Nos.  | 431      |          | 15,516.00        | -                |
| 5.1.4  | 9.1.11  | 3 C x 50 Sqmm  | 40     | Nos.  | 286      |          | 11,440.00        | -                |
| 5.1.5  | 9.1.10  | 3 C x 35 Sqmm  | 28     | Nos.  | 276      |          | 7,728.00         | -                |
| 5.1.6  | 9.1.9   | 3 C x 25 Sqmm  | 36     | Nos.  | 205      |          | 7,380.00         | -                |
| 5.1.7  | 9.1.8   | 3 C x 16 Sqmm  | 122    | Nos.  | 202      |          | 24,644.00        | -                |
| 5.1.8  | 9.1.7   | 3 C x 10 Sqmm  | 452    | Nos.  | 171      |          | 77,292.00        | -                |
| 5.1.9  | NSR     | 3 C x 6 Sqmm   | 88     | Nos.  |          | 269.00   | -                | 23,672.00        |
| 5.1.10 | NSR     | 3 C x 4 Sqmm   | 278    | Nos.  |          | 263.00   | -                | 73,114.00        |
| 6      | NSR     | Supply, loading, transportation unloading at site, storages at site, shifting from storage place to site of following sizes of 1.1kV grade XLPE insulated, Extruded PVC inner sheathed & overall FR-LS PVC outer sheathed, Aluminium conductor, <b>Armoured cables</b> as per IS:7098 Part-I or amended upto date and as per specifications. |        |       |          |          |                  |                  |
| 6.1    | NSR     | 3 C x 300 Sqmm   | 5,375  | Meter |          | 986.00   | -                | 5,299,750.00     |
| 6.2    | NSR     | 3 C x 120 Sqmm   | 1,112  | Meter |          | 511.00   | -                | 568,232.00       |
| 6.3    | NSR     | 3 C x 95 Sqmm  | 1,148  | Meter |          | 427.00   | -                | 490,196.00       |
| 6.4    | NSR     | 3 C x 50 Sqmm  | 981    | Meter |          | 374.00   | -                | 366,894.00       |
| 6.5    | NSR     | 3 C x 35 Sqmm  | 539    | Meter |          | 296.00   | -                | 159,544.00       |
| 6.6    | NSR     | 3 C x 25 Sqmm  | 792    | Meter |          | 234.00   | -                | 185,328.00       |
| 6.7    | NSR     | 3 C x 16 Sqmm  | 5,422  | Meter |          | 132.00   | -                | 715,704.00       |
| 6.8    | NSR     | 3 C x 10 Sqmm  | 12,219 | Meter |          | 124.00   | -                | 1,515,156.00     |
| 6.9    | NSR     | 3 C x 6 Sqmm   | 2,488  | Meter |          | 98.00    | -                | 243,824.00       |
| 7      | NSR     | 3 C x 4 Sqmm   | 9,166  | Meter |          | 84.00    | -                | 769,944.00       |
| 7      |         | CABLE TRAYS  |        |       |          |          |                  |                  |
|        |         | <b>Hot Dipped Galvanized Iron Cable Tray</b>   |        |       |          |          |                  |                  |
| 7.1    | 4.6     | Supplying and installing following size of perforated Hot Dipped Galvanized Iron cable tray (galvanisation thickness not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.          |        |       |          |          |                  |                  |
| 7.1.1  | 4.6.2   | 150 mm width X 50 mm depth X 1.6 mm thickness  | 1,062  | Meter | 504      |          | 535,248.00       | -                |
| 7.1.2  | 4.6.4   | 300 mm width X 50 mm depth X 1.6 mm thickness  | 552    | Meter | 703      |          | 388,056.00       | -                |
| 7.1.3  | 4.6.6   | 450 mm width X 50 mm depth X 2.0 mm thickness  | 255    | Meter | 1,024    |          | 261,120.00       | -                |
| 7.1.4  | 4.6.7   | 600 mm width X 50 mm depth X 2.0 mm thickness  | 127    | Meter | 1,257    |          | 159,639.00       | -                |

| S No.                           | Code No | Item Description   | Qty   | Unit  | DSR Rate | NSR Rate | Amount DSR Items    | Amount NSR Items     |
|---------------------------------|---------|--|-------|-------|----------|----------|---------------------|----------------------|
| 1                               | 1A      | 2  | 3     | 4     | 5        | 6        | 6                   | 8                    |
| 7.2                             | 4.7     | Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "bends" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.  |       |       |          |          |                     |                      |
| 7.2.1                           | 4.7.2   | 150 mm width X 50 mm depth X 1.6 mm thickness  | 34    | Nos.  | 976      |          | 33,184.00           | -                    |
| 7.2.2                           | 4.7.4   | 300 mm width X 50 mm depth X 1.6 mm thickness  | 17    | Nos.  | 1,447    |          | 24,599.00           | -                    |
| 7.2.3                           | 4.7.6   | 450 mm width X 50 mm depth X 2.0 mm thickness  | 10    | Nos.  | 2,184    |          | 21,840.00           | -                    |
| 7.2.4                           | 4.7.7   | 600 mm width X 50 mm depth X 2.0 mm thickness  | 8     | Nos.  | 2,731    |          | 21,848.00           | -                    |
| 7.3                             | 4.8     | Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray "Tee" (galvanisation not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required.  |       |       |          |          |                     |                      |
| 7.3.1                           | 4.8.2   | 150 mm width X 50 mm depth X 1.6 mm thickness  | 31    | Nos.  | 976      |          | 30,256.00           | -                    |
| 7.3.2                           | 4.8.4   | 300 mm width X 50 mm depth X 1.6 mm thickness  | 15    | Nos.  | 1,695    |          | 25,425.00           | -                    |
| 7.3.3                           | 4.8.6   | 450 mm width X 50 mm depth X 2.0 mm thickness  | 9     | Nos.  | 2,576    |          | 23,184.00           | -                    |
| 7.3.4                           | 4.8.7   | 600 mm width X 50 mm depth X 2.0 mm thickness  | 7     | Nos.  | 3,228    |          | 22,596.00           | -                    |
| Note                            |         | Contractor to ensure that cable trays and their supports are strong enough to take care of the loads of the cables without sagging and the supporting arrangement shall be safe enough to withstand earthquake situations as per seismic conditions prevailing at site. Contractor to improve upon specifications of trays and supports as specified in the specifications and BOQ, if it is felt necessary for the safety and with the approval of owner/PMC. |       |       |          |          |                     |                      |
| 8                               | 5       | <b>EARTHING</b>  |       |       |          |          |                     |                      |
| 8.1                             | NSR     | Providing and fixing 32 mm X 6 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.  | 297   | Meter |          | 350.00   | -                   | 103,950.00           |
| 8.2                             | 5.15    | Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.   | 1,050 | Meter | 129      |          | 135,450.00          | -                    |
| 8.3                             | NSR     | Providing and fixing 32 mm X 6 mm G.I. strip on surface or in recess for connections etc. as required.   | 650   | Meter |          | 126.00   | -                   | 81,900.00            |
| 8.4                             | 5.16    | Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.  | 450   | Meter | 37       |          | 16,650.00           | -                    |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |  |       |       |          |          | <b>3,044,687.00</b> | <b>42,929,546.00</b> |

**Project Name: Construction of Hospital and Academic Campus at All India Institute of Medical Sciences, Magalagiri District  
Guntur (AP)**

**Summary Sheet**

Note: Percentage should not quoted anywhere else except this summary page

| Name of the Bidder |                    |                          |  |                             |                                    |                 |
|--------------------|--------------------|--------------------------|--|-----------------------------|------------------------------------|-----------------|
| Sr.No.             | Particulars        | Cost as per BOQ (in Rs.) | percentage above or below the estimated cost | % above or below in Figures | Percentage above or below in Words | Amount (in Rs.) |
| 1                  | Civil Works        | 3712284196.79            |  |                             | Zero                               | 0.00            |
| 2                  | Plumbing Works     | 394466537.00             |  |                             | Zero                               | 0.00            |
| 3                  | Firefighting Works | 142068501.00             |  |                             | Zero                               | 0.00            |
| 4                  | Electrical Works   | 669978186.00             |  |                             | Zero                               | 0.00            |
| 5                  | HVAC Works         | 651172348.00             |  |                             | Zero                               | 0.00            |
|                    | <b>Total Cost</b>  | <b>5569969768.79</b>     |  |                             |                                    | <b>0.00</b>     |