MINISTRY OF HEALTH & FAMILY WELFARE
(Govt. of India, Nirman Bhavan, New Delhi)

Tender No. : HSCC/PMSSY/BHUBANESWAR/SS/2011 dated 20.12.2011
Name of Work : Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa).

AMENDMENT No.2 dated 30.12.2011

This has reference to the Tender No.HSCC/PMSSY/BHUBANESWAR/SS/2011 dated 20.12.2011 for **Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)**.

I. The following amendments are incorporated in the Invitation for Tender (Page 2, Volume I):

1. The **estimated Cost** for the Tender for Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa) is hereby revised to **Rs.3.72 crores** in lieu of Rs.2.5 crores.
2. The **Bid Security Amount** is hereby revised to **Rs.7.44 lakhs** in lieu of Rs.5 lakhs.
3. The **last date of submission of bids** is hereby extended upto 1500 hrs on **January 13, 2012**. and the bids shall be opened on the same day, i.e., January 13, 2012 at 1530 hrs.

The eligibility criteria shall therefore be based on the revised estimated cost.

II. The scope of works under the Tender is revised as below :

1. The Sub Head No.2 (Earthing, Safety Equipments & Misc. Items) is renumbered as Sub Head No. 4. Quantity of certain Items under the Sub-Head have been changed.
2. The Sub Head No.2 (Main LT Panel) and Sub-Head No.3 (LT Cables) have been added.
3. Sub Head No.3 (Civil Works) for Construction of Substation Building stands deleted from the scope of this tender.

Accordingly, fresh BOQ (Volume V) incorporating all the changes as above has been issued. Bidders are requested to quote the prices only in the new BOQ (Vol-V Including Amendments Dated 30.12.2011). Any bid not received in the BOQ attached with this Amendment shall be summarily rejected.

III. The Volume – IV (Technical Specifications & Drawings) are revised and enclosed along with this amendment.

The following conditions in the Tenders invited vide above tender notice are also hereby amended as detailed below:

Clause Reference Vol-I, Invitation for Tender Page 2

Existing Provision is as follows

"

Tender No.	Name & description of work	Estimated cost (Rs)	Completion period of work	Date of issue of tender document from	Last date of submission	Bid security amount (In Rs.)
HSCC/PMSSY/BHUBANESWAR/SS/2011	Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)	Rs. 2.5 Crores	5 Calendar months	23.12.2011 to 06.01.2012 upto 13:00 hrs.	06.01.2012 upto 15:00 hrs. Opening at 15:30 hrs.	Rs.5.0 lakhs

."

Amended Provision is as follows

"

Tender No.	Name & description of work	Estimated cost (Rs)	Completion period of work	Date of issue of tender document from	Last date of submission	Bid security amount (In Rs.)
HSCC/PMSSY/BHUBANESWAR/SS/2011	Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)	Rs. 3.72 Crores	5 Calendar months	23.12.2011 to 13.01.2012 upto 13:00 hrs.	13.01.2012 upto 15:00 hrs. Opening at 15:30 hrs.	Rs.7.44 lakhs

."

Clause Reference	Existing Provision	Amended Provisions
Vol-I Clause 2.1 Page 3	Application for Tender must be submitted complete in all respect in sealed envelopes in accordance with Clause 15.0 of Volume III which must be either delivered by hand or by registered mail, at HSCC (India) Ltd, Plot No. 6(A), Block-E, Sector-1, NOIDA, U.P.-201301, so as to reach not later than 30.11.2010 on or before 1500 Hrs. and be clearly marked "Supply, Installation, Testing & Commissioning	Application for Tender must be submitted complete in all respect in sealed envelopes in accordance with Clause 15.0 of Volume III which must be either delivered by hand or by registered mail, at HSCC (India) Ltd, Plot No. 6(A), Block-E, Sector-1, NOIDA, U.P.-201301, so as to reach not later than ***13.01.2012*** on or before 1500 Hrs. and be clearly marked "Supply, Installation, Testing & Commissioning

Clause Reference	Existing Provision	Amended Provisions
	of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)"	of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)"
Vol-I Clause 3.2(ii) Page 4	**.....** ***Similar works means Supply, Installation, Testing & Commissioning of HT Substation equipment including one transformer of individual capacity not less than 1250 KVA and Construction of Building.*** However, in case the bidder does not have experience of construction of Building such works shall be carried out by specialized agency after approval of their credentials by the Engineer. The bidder is required to give an undertaking as per enclosed format at Annexure-VII. A Copy of the work order and Certificate from client for completion of work(s) must be submitted along with application. ……	**.....** ***Similar works means Supply, Installation, Testing & Commissioning of HT Substation equipment including one transformer of individual capacity not less than 1250 KVA by Class A firm registered with CPWD.*** A Copy of the work order and Certificate from client for completion of work(s) must be submitted along with application. ……
Vol-III Clause 12.1 Page 6	The Bidder shall furnish, as part of his Bid, a Bid Security of the amount of **Rs. 500,000/- (Rs. Five Lakhs Only).** No deviation shall be permitted from this.	The Bidder shall furnish, as part of his Bid, a Bid Security of the amount of **Rs. 744,000/- (Rs. Seven Lakhs Forty Four Thousand Only).** No deviation shall be permitted from this.

The tender documents stand amended to the above extent. The bidders should download the Amendment(s) and enclose them along with their bids in Envelope No.2, duly stamped and signed.

All other terms & Conditions of the Tender shall remain unchanged.

-sd-
Chief General Manager (DC)
HSCC (India) Ltd.

Ministry of Health & Family Welfare
(GOVERNMENT OF INDIA)
Ministry of Health & Family Welfare
Nirman Bhavan, Maulana Azad Road
New Delhi – 110011

Tender for

Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)

Volume - IV
TECHNICAL SPECIFICATIONS

Tender No. HSCC/PMSSY/BHUBANESWAR/SS/2011

DECEMBER 2011

Consultant

HSCC (India) LTD.
(A Govt. of India Enterprise)
E-6A, Sector-1, Noida, U.P-201301
Phone: 0120-2542436-40, Fax: 0120-2542447
Website:http://www.hsccltd.com

Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

OF

ELECTRICAL WORKS

TECHNICAL SPECIFICATIONS

1.00 GENERAL SCOPE OF WORK

The scope of work shall cover 33 KV / 0.433 KV sub-station works for **"AIIMS Housing at Bhubneswar".** The scope of work covers major electrical equipments as per BOQ. Also, supply, installation, testing and commissioning of electrical works of the project including the following main items / systems:

i. H.T. Sub-station including VCB panel
ii. Transformers, bus ducts, HT cables etc

iii. Main LT, Capacitor panels (APFC),

iv LT Cabling.

v Earthing, safety equipments and misc. items required for electrical installation complete in all respect.

vi Testing and commissioning of all electrical installations

vii Any other items / works required for the completion of electrical works.

viii Enhancement / Sanctioning Electrical Load from State Electricity Board.

ix Submission of GA drawings of electrical equipments and getting approvals from Client / Owner before manufacturing / fabrication.

x Obtaining approvals from Chief Electrical Inspectors, Local Electricity Supply Authority, Telecom Department, and any other statutory authorities for the complete scope.

xi Contractor has to submit the working drawing based on our tender drawings for the approval of HSCC Electrical Engineer before commencement of work.

xii Incase, details of any electrical item / system are left out, then kindly refer the CPWD specifications & approval from Engineer.

2.0 REGULATIONS AND STANDARDS

2.1 **All equipments their installation, testing and commissioning shall confirm 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)- 2005
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 maintenance of switchgear and control gear.	ISI 10118 Part – 1 - 4
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 beakers	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)	Dry type power transformer	IS 11171

In case of contradiction in specification the priority of the documents shall be as follows:

CPWD / IS specification, BOQ, drawings, Technical specifications.

3.0 HIGH VOLTAGE PANEL:

The HV panel board shall be metal clad, indoor, floor mounting, free standing type. It shall be totally enclosed dust, damp and vermin proof, powder coated having incoming and out going feeders as per bill of quantity.

Separate earthed compartments shall be provided for circuit breakers, bus bars, relay and instruments, CT & PT and cable boxes, fully and effectively segregating these from one another so that fault in any one compartment do not cause damage to equipment(s) in other compartment(s).

The housing shall be of bolted construction to ensure compact and rigid structure. The sheet steel used shall not be less than 2 mm thick.

The panel shall be bolted together to form a continuous flush front switch gear suitable for front operation of board and for extension at both ends.

The HV panel board shall be designed such that the switchgear, instrument, relays, bus bar, wiring etc are arranged and mounted with due consideration for the following:

i) Facility for inspection, maintenance and repairs of testing terminals and terminals boards for ease of external connection.
ii) Minimum noise and vibrations
- Risk of accidental short circuits and open circuits
- Secured and vibration proof connections for poer and control circuits

iii) Risk of accidental contact and danger to personnel due to live connections.
iv) Mountings at approachable height.

3.1 Circuit Breaker:

The circuit breaker shall be complete with the following:

a) Racking-in / Racking-out mechanism.
b) Isolating plug and sockets.
c) Mechanical interlocks and safety features.
d) Mechanical ON / OFF indicators.
e) Minimum of 4 NO and 4 NC auxiliary contacts directly operated by the circuit breaker. Additional NO & NC contacts can be provided with auxiliary contacts.
f) Auto condensation space heaters suitable for operation on 240 V, 1 phase, 50 Hz A.C. for each panel wherever needed.
g) Suitable tripping arrangement.

h) Mechanical counters to assess the total number of operations of the breaker.

The circuit breaker shall be horizontal isolation, horizontal draw out pattern.

The breaker carriage shall be fabricated from steel, providing a sturdy vehicle for the circuit breaker. The carriage shall be mounted on the wheels, moving on guides, designed to align correctly and allow easy movement of the circuit breaker.

3.2 Current transformer:

Dual ratio CT of suitable burden shall be provided with 5 amp secondary current.

The CTs shall confirm to relevant Indian Standards. The design and construction shall be robust to with stand dynamic stresses during short circuit. Secondary terminals shall be brought out suitably to a terminal block which will easily accessible for testing and terminal connections. The protection CT shall be of accuracy class 5 P 10.

The metering CT shall confirm to the metring ratio and accuracy class 0.5.

3.3 Voltage Transformer:

A voltage transformer of burden not less than 100 VA and of proper ratio as specified and shall be provided. The accuracy class of VT shall be 0.5 for incoming feeders and class 1 for out going feeders.

The transformer shall be of cast epoxy rasin construction. HRC fuses / MCBs shall be provided on both HV and LV sides.

3.4 Wiring:

Wiring shall be carried out with minimum 1.5 Sq. mm FRLS / HFFR insulated copper conductor cables. CT wiring shall be done with minimum 2.5 sq. mm wires with colour code: RYB, gray for auxiliary DC circuit and black for auxiliary AC circuits. The wiring shall be securely fixed and neatly arranged to enable easy tracing of wires. Identification tags shall be fitted to all wires terminals to render identification easy and to facilitate checking in accordance with IS 375. Necessary terminal blocks and cable entries shall be provided for RTD relay wiring, power supply etc.

3.5 Installation:

The installation work shall cover assembly of panels lining up, grouting the units etc. In case of multi panels switch board after connecting up the bus bar all joints shall be insulated with HV insulation tape or with approved insulation compound. A common earth bar shall be run preferable at the back of the switch board connecting all the sections for connecting the earth system. All protection, indication & metering connections and wiring shall be completed. All relay instruments and meters shall be mounted and connected with appropriate wiring. Calibration checks of units as necessary and required by the licensee like CTs, PTs, energy meters etc shall be completed before pre-commissioning checks are undertaken.

3.6 Testing and commissioning:

Procedure for testing and commissioning of relay shall be in general accordance with good practice.

3.6.1 Factory Tests

The circuit breakers panel shall be subjected to routine tests at manufacturer's works in accordance with the details specified in the relevant IS specifications. These shall however necessarily comprise of the following.

a. Power frequency voltage test on the main power circuit.
b. Verification of the correct wiring / Functional Test.
c. Dielectric test at 1.5kV on the control circuit.

Apart form above, the vendor shall submit the routine test certificates for the following equipment.

i. Circuit Breakers
ii. Current Transformers
iii. Voltage Transformers

The vendor shall submit the type test certificate for following along with the offer.

a. Temperature rise test.
b. Impulse & power frequency voltage test
c. Short time current test on circuit breaker.

3.6.2 Site Test

3.6.2.1 General

1. Verification for completion of equipment, physical damage / deformities.
2. Alignment of panel, interconnection of busbars & tightness of bolts & connection etc.
3. Interconnection of panel earth busbar with plant earthing grid.
4. Inter panel wiring between transport sections.
5. Cleanliness of insulators and general Cleanliness of panel to remove traces of dust, water etc.

3.6.2.2 Circuit Breaker & Panel

1. Check for free movement of circuit breaker, lubrication of moving part & other parts as per manufacturers manual.
2. Manual / Electrical operations of the breaker and Functional test as per drawings.
3. Meggar before the Hi Pot test.
4. H.T. Test - Hi Pot test (Power frequency withstand test for one minute at 28kV RMS). At site Hi Pot test is carried out at 80% of 28kV RMS value.
5. Meggar after the Hi Pot test.
6. CT / PT ratio / polarity primary injection test.
7. Secondary injection test on relays to practical characteristics.

4.0 TRANSFORMER:

Transformer shall be suitable for operating at rated capacity continuously at any of the taps under ambient conditions and with the voltage and frequency variations indicated without exceeding permissible temperature rise and without any detrimental effect to any part.

Transformer shall be designed to be loaded as per IS:6600.

Off Load tap changer shall be provided in the transformers.

All windings shall have uniform insulation resistance to earth.

Disconnecting chamber shall be air filled. Suitable cable end box shall be provided for termination of cables. Gland plate for single core cables shall be non-magnetic.

Transformer shall be able to withstand electrodynamic and thermal stresses due to terminal short circuit of the secondary, assuming the primary side is being fed from an infinite bus. All leads and windings in cores shall be properly supported. Short circuits withstand and duration shall be 2 secs. As per IS: 2026.

Short circuit test results for similar transformers shall be furnished.

There shall be a marshalling box for gathering all alarm signals. All alarm shall be wired up to terminal strip provided in marshalling box. 20% spare terminals shall be provided. Armoured cable of 2.5 sq.mm. Cu shall be provided along with suitable size glands for terminating these contacts in marshalling box.

Guides shall be provided to facilitate tanking and untanking of the core with the coil assembly. The details of anchoring of core and coils assembly of tank shall be furnished.

Radiators shall be provided on the tank to facilitate cooling. These shall be detachable type and shall be provided with isolating valves at ends, drain plugs and air release plug. Radiators of 1.2 mm thickness seamless steel tubing or pressed sheet steel.

Means for lifting and jacking of transformer shall be provided.

Class-A insulating material specified in IS:1271 shall be used. Paper insulation shall be new and free from punctures. Wood insulation, wherever used, shall be well seasoned and treated.

The mineral oil shall comply with IS: 335. 10% extra oil in seal tins / drums shall be supplied.

All valves shall be of globe type. Valve body of carbon steel and trim of 135 cr. Steel.

Oil temp. Indicator for measuring top oil temp. Shall comprise 150mm dial type thermometer pocket and capillary tube jacketed with PVC sleeve. Thermo-meter shall have 2 sets of contacts, one for alarm and the other for trip, and set points can be set by hand. Contacts shall be wired up to marshalling box.

Buchholz relay shall be provided as per IS: 3637. It shall be double float type with two sets of contacts for alarm and trip with facility for testing by injection of air by hand pump and with cock for draining and venting of air. Relay shall be provided with shut off valves on conservator side as well as on tank side.

Alarm and trip contacts shall be suitable for 1A 230 AC.

A marshalling box shall be provided to accommodate all auxiliary devices except those which are to be located directly on transformer. It shall be of dust, weather and vermin proof type of sheet steel 2mm thick and shall have sufficient apace for ease of cabling. 20%extra terminals shall be provided.

All steel surfaces exposed shall be treated with suitable anti –trust, anti – corrosive paints

Bushing insulator shall be rated for max. System voltage and shall be as per IS. Bushing shall be enclosed in terminal box and shall be detachable from outside the tank. Separate neutral bushing shall be provided for earthing the neutral. When LT cable box is provided, a neutral bushing shall be brought out for solid earthing.

Transformer efficiency shall not be less than 98% at full load.

Transformer should be suitable for parallel operations. Both transformers shall have same percentage impedance & other characteristics for parallel operation of the transformers as per IS: 10028.

4.1 List of fittings:-

Oil sampling valves.

Filter valves with plug

Radiator shut off valves on top and bottom.

Buchholz relay shut-off valves

Oil temp. indicator and alarm.

Magnetic oil level gauge with min.&max. marking and shall have contact for low level.

Oil conservator complete with drain plug and oil filling hole with cover.

Buchholz relay with air release device and alarm and trip contacts.

Silica gel breather with oil seal and connecting pipe.

Explosion vent

Bidirectional rollers

Marshalling box

Rating plate

Diagram& terminal; marking plate

Lifting & Haulage lugs

Jacking pad

Earthing terminals

Air release device

Base channel with towing holes *(39 mm dia holes)

Off circuit tap changer with locking device .

Air filled disconnecting chambers.

Top filter valve with blanking plate.

Winding temperature alarm.

Neutral CT.

4.2 SOAK PIT

Soak pit for oil filled transformer shall be made are per IS 10028 (Part II) 1981 with up to dated amendments. Sump shall be formed in the transformer room and shall be connected to soak pit outside the transformer room with a pipe. All the civil works required for the soak pit shall be done by the contractor and the cost shall deemed to be included in quoted rates of the transformer item.

4.3 INSPECTION:

i) The transformer shall be inspected on arrival as per the inspection manual of the supplier
ii) Shall be examined of any sign of damage and special attention shall be given to the following parts.

Oil tank and cooling tubes
Bushes crakes or broken
Oil sight glass

4.4 INSTALLATION

i) The transformer shall be installed as per transformer manual of the transformer supplier and conforming to Indian standards.
ii) The transformer is to be erected on suitable size M.S channels embedded in the cement concrete flooring including providing & fixing the channel. The transformer supplied shall be lifted by all lifting lugs for the purpose of avoiding imbalance in transit.
iii) The transformer wheels shall be locked by suitable locking arrangement to avoid accidental movement of the transformer.
iv) The transformer cable end boxes shall be sealed to prevent absorption of moisture.
v) The transformer natural earthing and body earthing shall confirm to Indian Standard.

4.5 FACTORY TEST

The transformer shall be subjected to test as laid down in IS 2026 at factory / manufacturing unit prior to dispatch of the transformer to the site.
All original test certificates shall be furnished.

4.6 TESTING AT SITE

Prior to commissioning of the transformer the following tests shall be performed

i) Insulation resistance of the winding between phases and earth of H.V and M.V side.
ii) Winding resistance of all the winding on all tap positions shall be taken.

iii) Di-electric strength of the transformer oil shall be checked in accordance with India standards. In case the test is not satisfactory, the oil shall be filtered till proper dielectric strength of oil is obtained.
iv) The supplier gives sufficient advance information about the test schedule to enable the owner to appoint his representative.

5.0 Four Pole Structure:

Supply, erection testing and commissioning of four pole structure with suitable SMB structure with ISA bracing etc suitable for installing AB switches, lightening arrester, drop out fuses etc as per requirement of state electricity board. This includes supply of above items with pin/ disc insulators etc as per the requirements of State Electricity Board.

Copper earthing, GI plate earthing, 33KV, 433 V danger notice plate, Rubber mat, Fire bucket, Shock treatment chart, First Aid box , Fire extinguishers, Hand gloves etc are also in the scope.

6.0 DATA MANUAL AND DRAWINGS TO BE FURNISHED BY THE TENDERER:

The successful tenderer would be required to submit the following drawings with in 15 days of award of work for approval before commencement of installation:

a) General arrangement drawings of equipment like HT panel, transformers
b) Details of foundations for the equipments and the weight of assembled equipments.
c) Cable layout between HT panel board and transformers & LT panel etc.
d) Any other drawings necessary for the job.

7.0 INSTRUMENTATION MANUL

The successful bidder shall submit three copies of manual of complete instructions for the installations, operations, maintenance including

preventive maintenance 7 trouble shooting together with all the relevant data sheets, spare part catalogue etc.

8.0 INSPECTION AND TESTING:

All major equipments i.e. HT Panel, transformers, HT cables shall be offered for initial inspection at manufacturer's works before dispatch. The successful tenderer shall give advance notice of minimum two weeks regarding the dates proposed for such tests to the HSCC. The equipment will be inspected at the manufacturer's premises, before dispatch to site. The testing of equipments will be done based on BIS/ CPWD requirements.

Copies of all documents of routine and type test certificates of the equipment, carried out at the manufacturer's premises shall be furnished to the Engineer-in-charge.

After completion of work in all respects the contractor shall offer the installation for testing and operation.

9.0 COMPLIANCE WITH REGULATIONS AND INDIAN STANDARDS:

All works shall be carried out in accordance with relevant regulation, both statutory and those specified by the Indian standards related to the works covered by this specification. In particular, the equipment and installation will comply with the following:

i) Indian Electricity Rules
ii) B.I.S. and CPWD standards as applicable
iii) Workmen's compensation Act
iv) Statutory norms prescribed by local bodies, Power supply company, CEA etc.

After completion of the installation, the same shall be offered for inspection by the representative of Central electricity Authority/ state Electricity Authority as the case may be. The Contractor will extend all help including test facilities to the representative of the Authority. The observations of the Authority will be attended by the Contractor. The installation will be commissioned only after getting clearance from Authority.

Nothing in this specification shall be construed to relieve the successful tenderer of his responsibility for the design, manufacture and installation

of the equipment with all accessories in accordance with currently applicable regulations and safety codes.

10.0 Battery Charger Panel:

Battery & battery charging panel for providing 110V DC, 20 Amps to various devices in the HT panel. The DC operated devices are:

- Spring charging motor,
- Tripping coil,
- Closing coil
- Indicating lamp
- Relays, etc.

Panel will comprise of the following:

- Float/ Boost charger suitable for charging SMF batteries and simultaneously supplying DC power to load.
- SMF batteries of 40 Ah capacity to provide backup to load.
- 3 Ph/1Ph isolation transformers.
- One set essential commissioning spares.
- Batteries: The system shall have SMF batteries of 40 Ah capacity for backup mounted on a separate rack.

10.01 Battery charging equipment:

It comprises of float/boost charger and other components. The charger shall be a full wave bridge rectifier with SCR's/ diodes selected of liberal rating. The float charger shall be suitable for floating the batteries and capable of supplying a DC continuous load 20 Amps. The boost charger shall be suitable for floating the batteries and capable of supplying a DC continuous load of 20 amps. The boost charger shall be suitable for boost charging the discharged batteries as well as supplying power to the load.

Input voltage:	415V, +10%, & -15%
Phase:	3 Ph, 4 wire.
Frequency:	50Hz $\pm$ 5%
Output:	110V DC, 25 Amps
Regulation:	$\pm$ 1 % for a load variation from 0-100%
AC ripple in O/P:	Less than 2 %

10.02 System description:

Under normal conditions the charger shall be connected to the load bus and floating the batteries. In case of mains power failure the battery shall automatically start supplying load. Upon power supply resumption the boost charger shall charge the batteries there shall be auto-change over for charger between boost & float mode of charging. In case of second time mains failure during boost charging, provision shall be made to keep the DC supply continuous.

10.03 Construction:

The batteries shall be accommodated in battery rack. The battery charging equipment comprising of float/boost charger and other components shall be housed in a common cubicle of 1.6mm thick powder coated sheet steel of approved shade. The panel shall be indoor type. Panel shall be provided with louvers on both sides for proper ventilation. The louvers shall be backed by fine wire mesh to make the cabinet dust/vermin proof. The cubicle shall be floor mounted.

Components:

The system components shall be of superior quality and high reliability so as to ensure efficient and trouble free operation.

Metering:

- Ammeter for charger o/p current
- Input AC voltmeter.
- Ammeter for discharge/ charge current of the battery.
- Voltmeter for o/p DC voltage.

10.04 Protection:

Adequate protection shall be provided against overload, short circuit, load DC over/under voltage, battery earth fault, and thermal overload etc.

Indications:

Panel ON/OFF, battery on discharge, auto/ manual mode, AC mains on/off.

11.00 BUS DUCT

11.01 SCOPE

This section covers manufacture, supply, installation, resting and commissioning of sandwich insulated bus trunking. And rising mains, indoor / out door type.

11.02 Supply voltage

415 / 440 Volt, 3 phase, 4 wire, 50 Hz AC supply.

11.03 Standards for compliance:

IS:8623 / 1993 I & II and IEC 60439 / I & II.

11.04 Construction:

The enclosure will be made from CRCA sheet steel powder coated of approved shade. Bus bars would be of high conductivity aluminium in "Sandwich" construction and the conductors will be individually insulated with halogen free, fire retardant class– F – epoxy insulation. No drilling of Bus bar is permitted. Length of the section will be limited to maximum three metre. Bus bar of one section will be connected to bus bar of adjacent section by uni-block joint system removable as separate sub-assembly, so that it can be inserted or removed with out disturbing the adjacent sections.

11.04.1 Technical Parameters:

Bus trunking shall be designed to withstand short circuit current of 50 KA for one second.

Bus bar system should be designed for high temperatures withstand capability of 55 degree Celsius over 50 degree Celsius as normal operating temperature.

Insulation voltage 1.1 KV
Bus trunking will be suitably chosen to give permissible voltage drop.

Rated impulse withstands voltage 12 KV at 1000 volt.

Single bolt bridge system to be incorporated.

Plug in boxes

Plug in boxes will be of draw out type. Contacts will be of silver plated copper and spring loaded. Earth connection will be the first to make and last to break during insertion and withdrawl. Pluf in boxes will be made from 1.6 mm CRCA sheet steel powder coated. Inside the plug in Boxes MCCB or SFU with the fuses will be located as per requirements. The operating handle will be interlocked with plug in box cover so that MCCB can be operated only with the suitable cover in closed position. The plug in box will be interlocked with bus bar trunking so that it can not be inserted or removed with the plug in box lid open. MCCB / SFU will be of 4 pole type unless otherwise specified in BOQ. Short circuit breaking capacity of MCCB in PIB should be same as that of bus trunking i.e. 50 KA.

11.05 List of test to be carried out:

11.05.1 Routine tests:

i. Verification of insulation resistance.
ii. Inspection of assembly, interlocks, locks etc.
iii. Dielectric test.

Copies of the following certificate should be submitted:

i. Verification of temperature rise limits
ii. Verification of di-electric properties.
iii. Verification of short circuit strength.
iv. Verification of degree of protection.
v. Insulation resistance test with 500 volt megger. The insulation resistance shall be not less than 100 mega ohm.

12.0 L.T. PANELS AND CAPACITOR PANELS

12.1 GENERAL

Main / Sub Distribution Panels shall be indoor type, metal clad, powder coated, floor mounted, free standing, totally enclosed, extensible type, air insulated, cubicle type for use on 415 Volts, 3 phase, 50 cycles system.

12.2 CONSTRUCTION

Main / Sub Panels shall be:

i. Of metal enclosed, indoor, floor mounted, free standing construction (unless otherwise specified) type.

ii. Made up of the requisite vertical sections, which when coupled together shall form continuous dead front switchboards.

iii. Provide dust and damp protection.

iv. Be readily extensible on both sides by the addition of vertical sections after removal of the end covers in case of Main Panels.

v. All panels shall be front access type.

Main / Sub Panels shall be constructed only of materials capable of withstanding the mechanical, electrical and thermal stresses, as the effects of humidity, which are likely to be encountered in normal service.

Each vertical section shall comprise of the following:

i. A front-framed structure of rolled / folded sheet steel channel section, of minimum 2 mm thickness, rigidly bolted together. This structure shall house the components contributing to the major weight of the equipment, such as circuit breaker cassettes, moulded case circuit breaker, main horizontal busbars, vertical risers and other front mounted accessories. The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 2 mm thickness and 100 mm height. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.

ii. A cable chamber housing the cable end connections, and power/control cable terminations. The design shall ensure generous availability of space for ease of installation and maintenance of cabling, and adequate safety for working in one vertical section without coming into accidental contact with live parts in an adjacent section.

iii. A cover plate at the top of the vertical section, provided with a ventilating hood where necessary. Any aperture for ventilation shall be covered with a perforated sheet having less than 1 mm diameter perforations to prevent entry of vermin.

iv. Front and rear doors fitted with dust excluding neoprene gaskets with fasteners designed to ensure proper compression of the gaskets. When covers are provided in place of doors, generous overlap shall be assured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.

The height of the panels should not be more than 2400 mm for MV Panels. Operating handle of breaker in top most compartments shall not be higher than 1800 mm. The total depth of the panel should be adequate to cater to proper cabling space and should not be less than 350mm.

Doors and covers shall be of minimum 2mm thick sheet steel. Sheet steel shrouds and partitions shall be of minimum 1.6 mm thickness. All sheet panels shall be smoothly finished, leveled and free from flaws. The corners should be rounded. The apparatus and circuits in the power control centers (panels) shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.

Apparatus forming part of the Main/Sub Panels shall have the following minimum clearances.

i. Between phases - 32 mm
ii. Between phases and neutral - 26 mm
iii. Between phases and earth - 26 mm
iv. Between neutral and earth - 26 mm

When, for any reason, the above clearances are not available, suitable insulation shall be provided. Clearances shall be maintained during normal service conditions.

Creepage distances shall comply with those specified in relevant standards.

All insulating material used in the construction of the equipment shall be of non-hygroscopic material, duly treated to withstand the effects of the high humidity, high temperature tropical ambient service conditions.

Functional units such as circuit breakers and moulded case circuit breakers shall be arranged in multi-tier formation, except that not more than two air circuit breakers shall be housed in a single vertical section. Cable entry for various feeders shall be from the rear. Panel shall be suitable for termination of bus duct for incoming breakers.

Metallic / insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with:

i. Main busbars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.

ii. Cable termination of one functional unit, when working on those of adjacent unit / units.

All doors / covers providing access to live power equipment / circuits shall be provided with tool operated fasteners to prevent unauthorized access.

Provision shall also be made for permanently earthing the frames and other metal parts of the switchgear by two independent connections.

12.3 METAL TREATMENT & FINISH

All steel work used in the construction of the Main / Sub Panels should have undergone a rigorous metal treatment process as follows:-

i. Effective cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.

ii. Pickling in dilute sulphuric acid to remove oxide scales & rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.

iii. A recognized phosphating process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rusting in the event of the paint film being mechanically damaged.

This again, shall be followed by hot water rinsing to remove traces of phosphate solution.

iv. Passivating in de-oxalite solution to retain and augment the effects of phosphating.

v. Drying with compressed air in a dust free atmosphere.

vi. Panel shall be powder coated with epoxy based powder paint after the above process so as to render the material suitable for corrosive environment.

vii. Paint shade shall be Pebble (light) grey, shade no RAL 7032 unless otherwise specified.

12.4 BUSBARS

The busbars shall be air insulated and made of high conductivity, high strength aluminum alloy complying with the requirement of IS-5082.

The busbars shall be suitable braced with non-hygroscopic SMC supports to provide a through fault withstand capacity of 50 kA RMS symmetrical for one second. The neutral as well as the earth bar should be capable of withstanding the above level. Ridges shall be provided on the SMC supports to prevent tracking between adjacent busbars. Large clearances and Creepage distances shall be provided on the busbar system to minimize possibilities of fault.

The Main/Sub Panels shall be designed that the cables are not directly terminated on the terminals of breaker etc. but on cable termination links. Capacity of aluminum busbars shall be considered as 0.8 Amp per sqmm. of cross sectional area of the busbar. The main busbars shall have continuous current rating throughout the length of Panels. The cross section of neutral busbars shall be same as that of phase busbar for busbars of capacity up to 200Amp; for higher capacity the neutral busbar shall not be less than half (50%) the cross section of that the phase busbars. The busbar system shall consist of main horizontal busbar and auxillary vertical busbars run in busbar alley/chamber on either side in which the circuit could be arranged/connected with front access.

Connections from the main busbars to functional circuit shall be arranged and supported to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit currents. Busbars to be colour coded with PVC sleeves.

12.5 SWITCHGEARS

Refer subhead 5.00 – LT switchgears

12.6 CABLE TERMINATIONS

Cable entries and terminals shall be provided in the Main/Sub Distribution Panels to suit the number, type and size of aluminium conductor power cables and copper conductor control cable specified.

Provision shall be made for top or bottom entry of cables as required. A cable chamber 150 mm. high shall be provided at the bottom through out the length and depth of the MDB/SDB. Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated.

Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit.

Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults.

12.7 LABELS

Labels shall be anodised aluminium with white engraving on black background shall be provided for each incoming and outgoing feeder of Main/Sub Distribution and all Panels.

12.8 TEST AT MANUFACTURES WORK

All routine tests specified in IS: 8623-1977 shall be carried out and test certificates submitted.

12.9 TESTING AND COMMISSIONING

Commissioning checks and tests shall be included all wiring checks and checking up of connections. Primary / secondary injection tests for the relays adjustment / setting shall be done before commissioning in addition to routine meggar test. Checks and tests shall include the following.

a) Operation checks and lubrication of all moving parts.

b) Interlocking function check.

c) Insulation test: As per CPWD Specifications.

d) Trip tests & protection gear test.

13.00 L.T. SWITCHGEARS

13.01 AIR CIRCUIT BREAKERS

13.01.1 GENERAL

Air circuit breakers shall be incorporated in Main Distribution Panels wherever specified. ACBs shall conform to IS 13947 (Part 2) & IEC 947 (2) in all respects. ACBs shall be suitable for operation on 415 volts, 3 phase, 50Hz, AC supply.

13.01.2 TYPE AND CONSTRUCTION

Air Circuit Breakers shall be of enclosed pattern, dead front type with 'trip free' operating mechanism. It shall have microprocessor based electronic release. Air Circuit Breakers shall be EDO type (Electrically drawout type unless otherwise specified) with horizontal drawout carriage. The ACBs shall be strong and robust in construction with suitable arrangements for anchoring when in fully engaged or fully drawn-out positions. The carriage or cradle on which the breakers are mounted shall be robust design made of fabricated steel, supported on rollers. Cradle shall also comprise of main and secondary separable contacts and all draw out mechanism in a completely fig welded assembly. There shall be no dependence upon the switchboard frame for any critical alignment. The withdrawal arrangement shall be such as to allow smooth and easy movement.

All the current carrying parts of the circuit breakers shall be silver plated, suitable arcing contacts shall be provided to protect the main contacts. The contacts shall be of spring loaded design. The sequence of operation of the contacts shall be such that arcing contacts 'make before' and break after' the main contacts. Arcing contacts shall be provided with efficient arc chutes on each pole and these shall be such suitable for being lifted out for inspection of main as well as arcing contacts. The contact tips and arc chutes shall be suitable for ready replacement. Self aligning isolating contacts shall be provided. The design of the breaker shall be such that all the components are easily accessible to inspection, maintenance and replacement. Interphase barriers shall be provided to prevent flashover between phases.

13.01.3 OPERATING MECHANISM.

Air Circuit breaker shall be provided with a quick-make, trip free operating mechanism, the operating mechanism shall be 'strain-free' spring operated. The operating handle shall be in front of the panel type. The design shall be such that the circuit breaker compartment door need not be opened while moving the breaker from completely connected, through test, into the disconnected position. Electrical operated breakers shall have a motor wound spring charged closing mechanism. Breaker operation shall be independent of the motor, which shall be used solely for charging the closing spring. The operating mechanism shall be such that the breaker is at all times free to open immediately and the trip coil is energised. Mechanical operation indicator shall be provided to show open and closed position of breaker. Electrically operated breakers shall be additionally provided with mechanical indication to show charged and discharged condition of charging spring. 24 volt DC supply through battery backup for closing and opening for tripping circuit.
Means shall be provided for slow closing and opening of the breaker for maintenance purposes and for manual charging and closing of electrically operating breakers during emergencies.

13.01.4 INTERLOCKING AND SAFETY ARRANGEMENT

Air Circuit Breakers shall be provided the following safety and interlocking arrangements:

i. It shall not be possible for breaker to be withdrawn when in "ON" position.

ii. It shall not be possible for the breaker to be switched on until it is either in fully inserted position or for testing purposes it is in fully isolated position.

iii. The breaker shall be capable of being racked into 'testing', 'isolated' and ‘maintenance’ positions and kept locked in any of these positions.

iv. A safety catch to ensure that the movement of the breaker, as it is withdrawn is checked before it is completely out of the cubicle.

v. The operating mechanism shall provide for racking the breaker into connected, test and disconnected positions without operating

compartment door. When cubicle door shall be open position, the breaker can be pulled out to a fourth position, maintenance, where free access shall be possible to all parts of the breaker.

13.01.05 RATING

The rating of the circuit breaker shall be as per the drawings and schedule of quantities. Rated service breaking capacity (Ics) of the breakers shall be 50kA unless otherwise specified at 415 volts. The rated making capacity shall be as per the relevant standard.

13.01.06 ACCESSORIES

The breaker shall be equipped with electronic microprocessor based release to provide over current & earth fault protection. The breaker shall be fitted with following accessories for control, signal and interlocking.

i. Auxillary contacts 6 NO + 6 NC, of rating 16Amp at 415 volts 50Hz.

ii. Shunt release for tripping the breaker remotely and shall be suitable for 240 volt/415 volt 50Hz with range of operation from 10% to 130% of rated voltage.

iii. Micro switches shall be mounted on the cradle of draw out breaker to indicate the position of the breaker on the cradle.

   a. Kit for test/isolated indication.
   b. Kit for service position indication.
   c. Kit for shutter assembly.

iv. Accessories for following interlocking schemes shall be provided.

   a. Accessory kit for locking the breaker in isolated position. This kit is useful for interlocking scheme as well as keeping personnel and equipment safe.

   b. Door interlock kit: Panel or cubicle door cannot be opened with the ACB in Test or Service position.

   c. Lockable trip push button.

13.01.07 MOUNTING

Circuit Breakers shall be mounted as per manufacturers' standard practice.

13.01.08 TESTING

Testing of each circuit breaker shall be carried out at the works as per IS 2516 and the original test certificate shall be furnished in triplicate. The tests shall incorporate at least the following.

i. Impulse withstand test.

ii. Power frequency withstand test.

iii. Short circuit test.

iv. Temperature - rise test under rated conditions.

13.02 MOULDED CASE CIRCUIT BREAKERS.

13.02.01 GENERAL

Moulded Case Circuit Breaker shall be incorporated in the Main / Sub Distribution Boards wherever specified. MCCBs shall conform to IS 13947 (Part 2) & IEC 947 (2) in all respects. MCCBs shall be suitable either for single-phase AC 230 volts or three phase 415 volts. All MCCBs shall have microprocessor based over current and short circuit releases with adjustable current setting from 0.4In to 1.0 In.

13.02.02 Technical Specifications

The MCCB should be current limiting type with trip time of less than 10 milli sec under short circuit conditions. The MCCB should be either 3 or 4 poles as specified in BOQ.

MCCB shall comply with the requirements of the relevant standards IS13947 – Part 2 /IEC 60947-2 and should have test certificates for breaking capacities from independent test authorities CPRI / ERDA

MCCB shall comprise of Quick Make -break switching mechanism, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses.

The breaking capacity of MCCB shall be minimum 35KA / 50 KA or as specified in BOQ. The rated service breaking capacity should be equal to rated ultimate breaking capacities (Ics=Icu).

All MCCBs upto 200A ratings should be provided with Thermal Magnetic type release with adjustable Overload and fixed short circuit protections. MCCBs of ratings 250A & above shall be provided with Microprocessor based having inbuilt adjustable protections against Over Load (L), Short Circuit (S) and Ground Faults (G)] with time delay.

All MCCBs should be provided with the Rotary Operating Mechanism. The ROM should be with door interlock (with defeat feature) & padlock facility

MCCB should have Spreader links & Phase barriers as standard feature. Superior quality of engineering grade plastics confirming to glow wire Tests as Per IEC 60695-2-1 should be used for insulation purpose.

The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to disconnection as per the IS/IEC indicating the true position of all the contacts.

13.02.02 FRAME SIZES

The MCCBs shall have the following frame sizes subject to meeting the fault level.

a. Upto 100A rating ..... 100A frame.
b. Above 100A upto 200A ..... 200A frame.
c. Above 200A up to 250A ..... 250A frame.
d. Above 250A up to 400A ..... 400A frame.

e. Above 400A up to 630Aq ..... 630A frame.
f. Above 630A to 800A ..... 800A frame.

13.02.03 CONSTRUCTIONS

The MCCB's cover and case shall be made of high strength heat treatment and flame retardant thermo-setting insulating material. Operating handle shall be quick make/quick break, trip-free type. The operating handle shall have suitable "ON", "OFF" "and" "tripped" indicators. Three phase MCCBs shall have common operating handle for simultaneous operation and tripping of all the three phases. MCCBS shall be provided with rotary handle.

Suitable extinguishing device shall be provided for each contact. Tripping unit shall be of thermal magnetic or static release type provided in each pole & connected by a common trip bar such that tripping of any pole operates all three poles to open simultaneously. MCCB shall be current limiting type.

Contact trips shall be made of suitable air resistant, silver alloy for long electrical life. Terminals shall be of liberal design with adequate clearance.

13.02.04 BREAKING CAPACITY

Unless otherwise specified, rated service breaking capacity of the Moulded Case Circuit Breakers shall be minimum 25kA or as mentioned in the BOQ

13.02.05 TESTING

a. Original test certificate of the MCCB as per Indian Standards (IS) 315-C-8370 shall be furnished.

b. Pre-commissioning tests on the Main Distribution/Sub Distribution Board incorporating the MCCB shall be done as per standard.

13.03 SWITCH DISCONNECTOR FUSE UNITS

The Switch Disconnector Fuse Units shall be double break type suitable for load break duty (AC 23) quick make and break action. Hinged doors shall be duly interlocked with operating mechanism so as to prevent opening of the door when the switch is in 'ON' position and also prevent closing of the switch when the door is not properly secured. All contacts incoming and outgoing terminals of switch shall be adequately sized to receive proper size of cables. High rupturing capacity (HRC) fuse links shall be provided with switch fuse units and shall be in accordance with IS 13703-1&2-1993 and having rupturing capacity of not less than 31 MVA at 415 volts. HRC fuse links shall be provided with visible indicators to so that they have operated. The switch disconnector fuse units shall be manufactured in accordance with IS 13947-3-1993.

FUSE

Fuse shall be of the high rupturing capacity (HRC) fuses links and shall be in accordance with IS 13703-1&2-1993 and having rupturing capacity of not less than 31 MVA at 415 volts. The backup fuse rating for each motor / equipment shall be chosen as the fuse does not operate on starting of motors / equipments.

13.04 MEASURING INSTRUMENTS, METERING & PROTECTION

13.04.01 GENERAL

Direct reading electrical instruments shall be in conformity with IS 1248. The accuracy of direct reading shall be 1.0 for voltmeter and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5. The errors due to variations in temperature shall be limited to a minimum. The meter shall be suitable for continuous operation between -10 degree Centigrade to + 50 degree Centigrade. All meters shall be of flush mounting type of 96mm square or circular pattern. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instrument glass. Instruments meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale markings.

The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right.

Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three-phase supply.

The specifications herein after laid down shall also cover all the meters, instrument and protective devices required for the electrical work. The ratings type and quantity of meters, instruments and protective devices shall be as per the schedule of quantities.

13.04.02 AMMETERS

Ammeters shall be moving iron or moving coil type/ digital. The moving part assembly shall be with jewel bearing. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks, the ammeters shall be manufactured and calibrated as per the latest edition of IS:1248. Ammeters shall be instrument transformer operated, and shall be suitable for 5A secondary of instrument transformer. The scales shall be calibrated to indicate primary current, unless otherwise specified. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

13.04.03 VOLTMETERS

Voltmeter shall be of moving iron or moving coil type/ digital. The range for 415 volts, 3 phase voltmeters shall be 0 to 500 volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The voltmeter shall be provided with protection fuse of suitable capacity.

13.04.04 CURRENT TRANSFORMERS

Current transformers shall be in conformity with IS: 2705 (Part I, II & III) in all respects. All current transformers used for medium voltage applications shall be rated for 1kV. Current transformers shall have rated primary current, rated burden and class of accuracy as required. However, the rated acceptable minimum class of various applications shall be as given below:

Measuring : Class 0.5 to 1

Protection : Class 5P10.

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 50KA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Separate CT shall be provided for measuring instruments and protection relays. Each C.T. shall be provided with rating plate.

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CT's shall be copper conductor, PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

All Current Transformer shall be Cast resin type.

13.05 MISCELLANEOUS

Control switches shall be of the heavy-duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting.

Indicating lamps shall be of the filament type of low watt consumption, provided with series resistor where necessary, and with translucent lamp covers, bulbs & lenses shall be easily replaced from the front.

Push buttons shall be of the momentary contact, push to actuate type fitted with self-reset contacts & provided with integral escutcheon plates marked with its functions.

14.00 LT CABLES

14.1 GENERAL

L.T. Cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drums. The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

14.2 MATERIAL

The L.T. power cable shall be PVC insulated PVC sheathed type aluminium conductor armoured cable and L.T. control cable shall be PVC insulated PVC sheathed type copper conductor unarmoured cable conforming to IS: 1554: 1988 (Part-I) with up to date amendments.

14.3 INSTALLATION OF CABLES

Cables shall be laid directly in ground, pipes, masonary ducts, on cable tray, surface of wall/ceiling etc. as indicated on drawings and/or as per the direction of HSCC Electrical Engineer. Cable laying shall be carried out as per CPWD specifications.

14.4 INSPECTION

All cables shall be inspected at site and checked for any damage during transit.

14.5 JOINTS IN CABLES

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoiding of cable joints. This apportioning shall be got approved from Engineer-in-Charge before the cables are cut to lengths.

14.6 LAYING CABLES IN GROUND

Cables shall be laid by skilled experienced workmen, using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. With great care it shall be unrolled on over wooden rollers placed in trenches at intervals not exceeding 2 metre. Cables shall be laid at depth of 0.75 metres below ground level for LT Cables and 1 metre below ground level for HT cable.

A cushion of sand total of 250mm shall be provided both above and below the cable, joint boxes and other accessories. Cable shall not be laid in the same trench or along side a water main.

The cable shall be laid in excavated trench over 80mm layer of sand cushion. The relative position of the cables, laid in the same trench shall preserved. At all changes in direction in horizontal and vertical planes, the cables shall be bent smooth with a radius of bent not less than 12 times the diameter of cables. Minimum 3 metre long loop shall be provided at both end of cable.

Distinguishing marks may be made on the cable ends for identifications of phases. Insulation, tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identifications.

Cable route marker shall be provided as per CPWD specifications. Cost of cable route markers is deemed to be included in the cost of cables / cable laying.

PROTECTION OF CABLES

The cables shall be protected by bricks laid on the top layer of the sand for the full length of underground cable. Where more than one cable is laid in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80mm on either side of the cables. Cable under road crossings and any other places subject to heavy traffic shall be protected by running them through Hume Pipes of suitable size. Pipes for cable crossing the road shall be laid at a depth of 1000 mm.

EXCAVATION & BACK FILL

All excavation and back fill required for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceeding 150mm. Each layer shall be properly rammed and consolidated before laying the next layer.

The Contractor shall restore all surfaces, road ways, side walks, curbs, wall or the works cut by excavation to their original condition to the satisfaction of the Engineer-in -Charge.

LAYING OF CABLES ON CABLE TRAY/SURFACE OF WALL/ CEILING

Cable shall be laid on perforated M.S. Cable tray / ladders. Cables shall be properly dressed before cable ties / clamps are fixed. Wherever cable tray is not proposed, cables shall be fixed on surface of wall or ceiling slab by suitable MS clamps / saddles. Care shall be taken to avoid crossing of cable.

CABLES ON HANGERS OR RACKS

The Contractor shall provide and install all iron hangers racks or racks with die cast cleats with all fixings, 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 hangers or racks shall be designed to leave at least 25mm clearance between the cables and the face to which it is fixed. Multiple hangers shall have two or more fixing holes. All cables shall be saddled at not more than 150mm centres. These shall be designed to keep provision of some spare capacity for future development.

CABLES TAGS

Cable tags shall be made out of 2mm thick aluminium sheets, each tag 1-1/2 inch in dia with one hole of 2.5mm dia, 6mm below the periphery. Cable designations are to be punched with letter / number punches and the tags are to be tied inside the panels beyond the glanding as well as below the glands at cable entries. Tray tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 metres.

14.7 TESTING OF CABLES

Prior to installation burying of cables, following tests shall be carried out. Insulation test between phases, phase & neutral, phase & earth for each length of cable.

a. Before laying.
b. After laying.
c. After jointing.

Along with the test as prescribed in IS Code, cross sectional area shall also be checked.

On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer in Charge.

a. Insulation Resistance Test (Sectional and overall).

b. Continuity Resistance Test.

c. Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard code of practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipments and labour for conducting the above tests & shall bear all expenses of conducting such tests.

15.00 CABLE TRAY

15.01 Ladder Type Cable Tray

Ladder type cable tray shall be fabricated out of double bended channel section longitudinal members with single bended channel section rungs of cross members welded to the base of the longitudinal members at a centre to centre spacing of 250 mm. The channel sections shall be supplied in convenient lengths and assembled at site to the desired lengths. These may be galvanised or painted to the desired lengths.

15.02 Perforated Type Cable Tray

The cable tray shall be fabricated out of slotted / perforated M.S. Sheet as channel section single or double bended. The channel section shall be supplied in convenient length and assembled at site to the desired lengths. These shall be galvanised or painted as specified. Alternatively, where specified, the cable tray may be fabricated by two angle irons of 50mm x 50mm x 6mm as two longitudinal members, with cross-bracings between them by 50mm x 5mm flats welded / bolted to the angles at 1 m spacing. 2mm thick MS perforated sheet shall be suitably welded / bolted to the base as well as on the two sides.

15.03 Typically, the dimensions, fabrication details etc. are shown in CPWD General Specification for Electrical Works - Part II -External, 1994.

15.04 The jointing between the sections shall be made with coupler plates of the same material and thickness as the channel section. Two coupler plates, each of minimum 200mm length, shall be bolted on each of the two sides of the channel section with 8mm dia round headed bolts, nuts and washers. In order to maintain proper earth continuity bond, the paint on the contact surfaces between the coupler plates and cable tray shall be scraped and removed before the installation.

15.05 The maximum permissible uniformly distributed load for various sizes of cables trays and for different supported span are as per CPWD General Specification of Electrical Work Part II -1994. The sizes shall be specified considering the same.

15.06 The width of the cable tray shall be chosen so as to accommodate all the cable in one tier, plus 30 to 50% additional width for future expansion. This additional width shall be minimum 100mm. The overall width of one cable tray shall be limited to 800mm.

15.07 Factory fabricated bends, reducers, tee/cross junctions, etc. shall be provided as per good engineering practice. (Details are typically shown in figure 3 of CPWD General Specification of Electrical Work Part II -1994). The radius of bend, junctions etc. shall not be less than the minimum permissible radius of bending of the largest size of cable to be carried by the cable tray.

15.08 The cable tray shall be suspended from the ceiling slab with the help of 10mm dia MS rounds or 25mm x 5mm flats at specified spacing as per CPWD General Specification of Electrical Work Part II -1994. Flat type suspenders may be used for channels upto 450mm width bolted to cable trays. Round suspenders shall be threaded and bolted to the cable trays or to independent support angles 50mm x 50mm x 5mm at the bottom end as specified. These shall be grouted to the ceiling slab at the other end through an effective means, as approved by the PMC/Consultant to take the weight of the cable tray with the cables.

15.09 The entire tray (except in the case of galvanised type) and the suspenders shall be painted with two coats of red oxide primer paint after removing the dirt and rust, and finished with two coats of spray paint of approved make synthetic enamel paint.

15.10 The cable tray shall be bonded to the earth Terminal of the switch bonds at both ends.

15.11 The cable trays shall be measured on unit length basis, along the center line of the cable tray, including bends, reducers, tees, cross-joints, etc, and paid for accordingly.

16.00 EARTHING

16.01 GENERAL

All the non-current metal parts of electrical installation shall be earthed properly. All metal conduits trunking, switchgear, distribution boards, switch boxes, outlet boxes, and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. Earthing work shall conform to CPWD General Specifications for Earthing work shall conform to Internal) -1994 and Indian Electricity Rules 1956 amended up to date and in the regulations of the local Electricity Supply Authority.

16.02 EARTHING CONDUCTOR

Earth continuity conductor along with submain wiring from Main/Sub Distribution boards to various distribution boards shall be of copper. Earth continuity conductor from distribution board onward up to outlet point shall also be of bare copper. Earth continuity conductor connecting Main & Sub Distribution boards to earth electrode shall be with galvanised MS strip.

16.03 SIZING OF EARTHING CONDUCTOR

Single phase distribution board shall have one earth continuity conductor while three phase distribution board shall be provided with two earth continuity conductors. Earthing of main switch board and sub switch boards shall be earthed with two independent earth electrodes or as indicated elsewhere. Earth conductor laid in ground shall be protected for mechanical injury & corrosion by providing GI pipe.

16.04 GI pipe shall be of medium class 40mm dia and 4.5 metre in length. Galvanising of the pipe shall conform to relevant Indian Standards. GI pipe electrode shall be cut tapered at the bottom and provided with holes of 12mm dia drilled not less than 7.5cm from each other upto 2 metre of length from bottom. The electrode shall be buried in the ground vertical

with its top not less than 20cm below ground level as per detail enclosed. Earth electrode shall not be situated less than 2metres from the building. The location of the earth electrode will be such that the soil has reasonable chance of remaining moist as far as possible. Masonry chamber of size 300 x 300 x 300mm shall be provided with water funnel arrangement a cast iron or MS frame & cover having locking arrangement at the top.

16.05 PLATE EARTH ELECTRODE

Earthing shall be provided with either GI plate electrode or copper plate electrode of following minimum dimensions.

i. GI Plate Electrode : 600mm x 600mm x 6mm thick

ii. Copper Plate Electrode : 600mm x 600mm x 3mm thick

The electrode shall be buried in ground with its faces vertical and not less than 3 metres below ground level. 20mm dia medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top of this pipe for watering and earth electrode. Earth electrode the watering funnel attachment shall be housed in masonry enclosure of not less than 300 x 300 x 300mm deep. A cash iron or MS frame with cover having locking arrangement shall be provided at top of metres from the building. Care shall be taken that the excavation for earth electrode may not affect the column footing or foundation of the building. In such cases electrode may be further away from the building.

16.06 ARTIFICIAL TREATMENT OF SOIL

If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by addition of sodium chloride calcium chloride, sodium carbonates copper sulphate, salt and soft coke or charcoal in suitable proportions.

16.07 RESISTANCE TO EARTH

The resistance of earthing system shall not exceed 5 ohm.

17.00 SAFETY EQUIPMENTS

17.01 DANGER NOTICES

Danger notices shall be affixed permanently in a conspicuous position in Hindi or English and the local language of the district with sign of skull and bones at every overhead lines, transformer, electrical equipments motors, etc.

17.02 FIRST AID BOX

Standard first aid box with all standard contents shall be supplied.

17.03 FIRE BUCKETS

The fire bucket unit shall consist of our galvanised iron baskets, which shall be with round bottom, and of 13 liters capacity. They shall be filled with dry sand. Arrangement shall be made to hang them on GI pipe stand comprising of at least 2 vertical and one horizontal members of 50 mm GI pipe. The stands shall have hooks and locking chain arrangement. The buckets and stand shall be painted with epoxy red paint.

17.04 FIRE EXTINGUISHER

Foam type Fire extinguishers of 9 Kg. capacity and Dry Chemical type Fire Extinguishers of 10 Kg capacity shall be of approved make. It shall be filled with carbon tetrachloride. It shall have horns. Extinguishers shall be fixed on walls / columns with necessary clamps made out of 50 mm x 6mm MS flat and coated bolts and nuts grouted in wall / column.

17.05 RUBBER MAT

Corrugated rubber insulating matting shall be provided in front of all power & motor control centers, push button station and distribution board in the electrical rooms. The width of matting shall be one meter. It shall be as ISI mark.

17.06 INSTRUCTION CHART

Printed instruction chart both in English and Hindi and duly framed with front glass, prescribing treatment to be given to persons having Electric shock, shall be supplied.

18.00 PROCUREMENT, INSPECTION OF EQUIPMENT & APPROVALS

Approved list of makes and vendors are given in the end of technical specifications. The makes of equipment / materials supplied shall be strictly as mentioned therein. For items not specially mentioned, prior approval shall be taken before procurement of the same. All equipments / material supplied shall be brand new and shall be procured directly from the manufacturers, dealers or authorised agents.

HSCC Electrical Engineer shall have access to the manufacturer's premises for stage inspection / final inspection of any item during its design, manufacturing, and assembly and testing. After carrying out the necessary factory tests and routine tests as per IS Standards, a copy of the routine test certificate shall be forwarded along with the call for carrying out the inspection at the manufacturer's works.

Based on the inspection certificate, HSCC Electrical Engineer reserves the right to carry out the inspection at a mutually agreed date and / or give inspection waiver. A minimum of two weeks will be needed after receipt of complete shop inspection report and other details to depute our inspector for inspection.

It is the responsibility of the contractor to ensure that all electrical works are carried out as per the IE Rules & regulations, National Building Code and IS Codes & Standards. All necessary drawings and details as required by Electricity Board, Electrical Inspector, Fire Department and other Local Statutory agencies, shall be prepared by the contractor. **The contractor is responsible to submit the drawings and other details as required to the Local Authorities (refer above) and obtain necessary approvals including sanction of load/enhancement of electrical load from SEB before energizing and commissioning.** All official fee required for getting the approval will be reimbursed on account of Client on submission of original documents.

19.00 CAPACITOR PANEL

19.01 SCOPE

Supply, installation, testing and commissioning of medium voltage capacitors and Automatic Power Factor Correction Panel (APFC) for improvement in power factor of electrical system. It will be connected to main LT panel. It shall improve power factor up to 0.98 legging from initial power factor. Capacitor panel shall be provided with day/ night mode selector switch and double ratio C.Ts, for day/ night mode. Day/ night mode shall be selected based on estimated day / night load requirement.

19.02 RATING

Capacitor units as specified in the BOQ shall be used to form a bank of capacitors.

19.03 ENCLOSURE

The panel shall be indoor, floor mounted and free standing type with IP-42 degree of protection. It shall be completely made of CRCA sheet steel. The enclosure shall have sturdy support structure and shall be finished with powder coating in the approved colour shade. Suitable provisions shall be made in the panel for proper heat dissipation. Air aspiration louvers for heat dissipation shall be provided. The front portion shall house the switchgear and the rear portion shall house capacitors and series reactors (7%). The enclosure is to be suitably sized to accommodate all the components, providing necessary air clearance between live and non-live parts, providing necessary working clearance.

19.04 APFC Relay

Microprocessor based APFC relay, (intelligent VAR controller) of suitable steps as mentioned in the BOQ, shall sense the PF in the system and automatically switch ON/OFF the capacitor unit or bank to achieve the preset target PF. The controller shall have digital settings of parameters like PF, switching time delay, step limit etc, indication of PF, preset parameter, minimum threshold setting of 1% of CT current.

19.05 CAPACITORS

The capacitor shall generally confirm to IS:13341-1992 and 13340-1993 and IEC 60831-1 &2.

General specification: three phase, delta connected, 50 Hz.

i. **Voltage:** Must be designed to with stand system over voltage, increased voltage due to series reactor and harmonics.

ii. **Capacitor type:** The capacitor unit shall be super heavy duty mix dielectric type. The dielectric should be made of metalised tissue paper. These elements shall be combination of capacitor tissue paper and BOPP film impregnated with non PCB bio-degradable impregnant or film foil capacitor manufactured using Poly Propylene film placed between 2 layers of metal foil and winding. Capacitor should be fitted with safety device like pressure sensitive disconnector. The capacitor should be low loss type (total losses should not exceed 0.45 W / KVAR).

iii. **Temperature category:** -25 degree C to 70 degree C.

iv. **Over voltage** +10% (12h in 24 hours), +15%(30 minutes in 24 hours), +20% (5 minutes) and 30% for I minute as per clause 6.1 of IS 13340-1993.

v. **Over current:** 2.5x In

vi. **Peak inrush current withstand:** 350 x In

vii. Capacitor shall be provided with permanently connected discharge resistors so that residual voltage of capacitors is reduced to 50 volts or less within one minute after the capacitors are disconnected from the source of supply.

viii. Each capacitor bank shall be provided with a terminal chamber and cable glands suitable for AYFY cable as specified.

ix. Two separate earthing terminals shall be provided for earth connection of each bank.

19.06 SWITCHGEAR & PROTECTION:

Incomer switchgear will be as specified in BOQ. Suitable contactor for each step shall be used and must be capable of capacitor switching duty. Busbars shall be suitably colour coded and must be mounted on appropriate insulator supports.

Power cable used shall have superior mechanical, electrical and thermal properties. Internal wiring between main bus bars, contactor, capacitor etc shall be made with 1100 volt grade PVC insulated FRLS copper conductor of appropriate size by using suitable copper crimping terminal ends etc suitable bus links for input supply cable termination shall be provided.

Control circuit shall be duly protected by using suitable rating MCB. An emergency stop push button shall be provided to trip thr entire system (22.5 mm dia, mushroom type, press to stop and turn to reset). 440 Volt caution board shall be provided on the panel.

19.07 TESTS AT AMNUFACTURER'S WORKS:

All routine and type tests as per IS:2834 relevant to capacitor bank s as amended upto date shall be carried out at manufacturer's works and test certificates to be submitted to HSCC.

19.08 TESTS AT SITE:

Insulation resistance with 500 V DC Megger shall be carried out and test results should be recorded.

Residual voltage shall be measured after switching of the capacitors and the same shall not be more than 50 volts after one minute. Each discharge resister shall be tested for its working.
Drawings and Instruction manual:

19.09 INSTALLATION:

Capacitor bank shall be installed at least 30 CM away from the walls on suitable frame work of welded construction. The earth terminals provided on the body of capacitor bank shall be bonded to main capacitor panel earth bus with 2 nos 8 SWG copper or 6 SWG GI earth wire.

Contractor shall submit four copies of the following certified drawings:

i. General arrangement of capacitor bank and control panel indicating main dimensions, type of mounting, location of various devices etc., including foundation details.
ii. Schematic diagram for automatic sequential switching with terminals and ferrules numbers.
iii. Wiring diagram of control panel indicating terminal blocks and various apparatus.
iv. Final list of components of control panel.

Contractor shall also submit four sets of installation and maintenance manual.

20.0 List of Approved manufacturers:

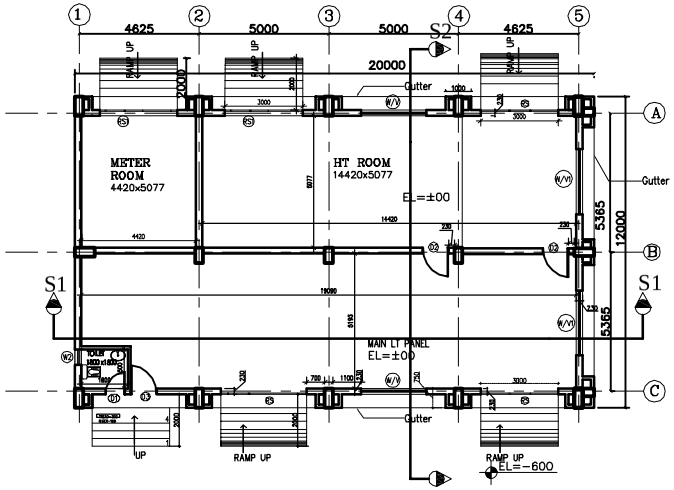
1.	33 KV VCB Panel Board:	Siemens / Alsthom / Crompton Greaves / ABB / Schneider-Areva
2.	Transformer:	Crompton Greaves / Alsthom / Schneider- Areva, / Bharat Bijlee
3.	33 KV XLPE Cable:	Universal / NICCO / CCI / Incab
4.	LT Cables:	Universal / NICCO / CCI / Incab / Rallison / Polycab
5.	Bus Duct:	L&T / Siemens / ABB / GE / Schneider
6.	Cable joint kit	Raychem , 3M, Cabseal

7.	LT Panel / capacitor Panel	-	L&T, Siemens, ABB, Schneider
8.	Air Circuit Breakers	-	L&T
		-	Siemens
			ABB
		-	Schneider
9.	MCCB	-	L&T / Siemens / ABB / Schneider
10.	SDFU	-	L&T / ABB / Siemens / Schneider
11.	Power Contactors	-	L&T / Siemens / Schneider / ABB

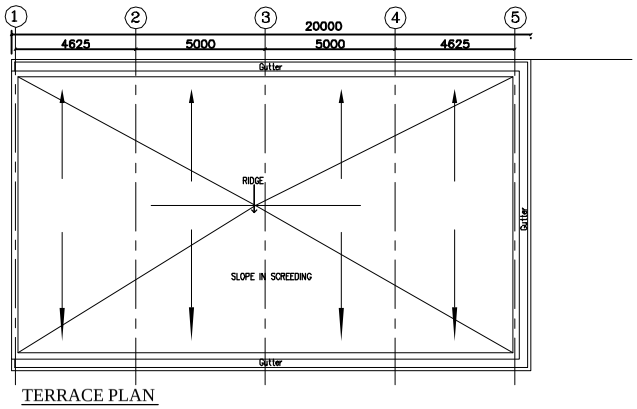
21.00 LIST OF TENDER DRAWINGS

S.No.	Drawing Number	Description

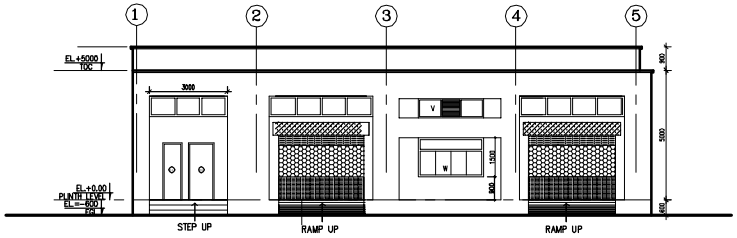
As Enclosed



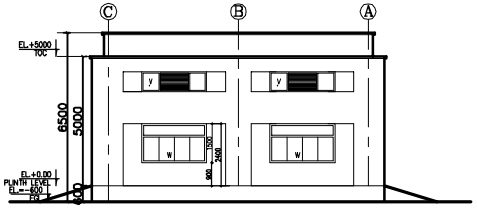
SUB STATION PLAN



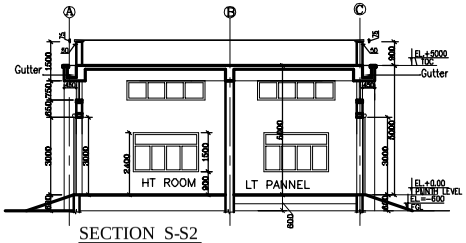
TERRACE PLAN



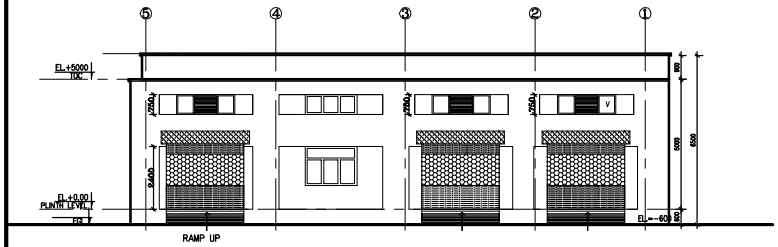
FRONT ELEVATION



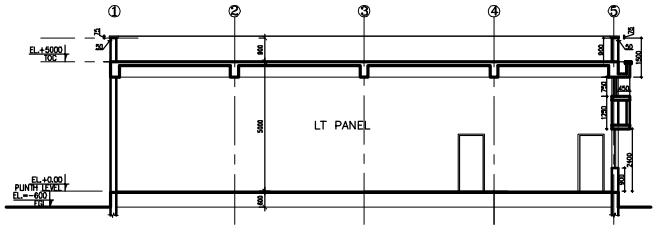
RIGHT SIDE ELEVATION



SECTION S-S2



REAR ELEVATION



SECTION S-S1

NOTES

1.	D1	750 X 2200	000	2200	
2.	D2	1000 X 2200	000	2200	
3.	D3	1200x2200	000	2200	
4.	RS1	3000 X 3000	100	3000	
5.	V	1200X600	3800	4400	
6.	V1	3000X750	2200	3950	
7.	W1	2500X2300	900	2300	
8.	W2	600X1000	1200	2200	

REV	DATE	DESCRIPTION

REVISION

PROJECT

AIIMS HOUSING
BHUBANESWAR

TITLE

TENDER DRAWING
SUB-STATION

Floor Plans,Elevations & Sections

HSCC/ /006/TD/SS/040/R
Drawing No.

HSCC/263	1:100	Dec'11
Job No.	Scale	Date
App by	Rev. by	Prep. by

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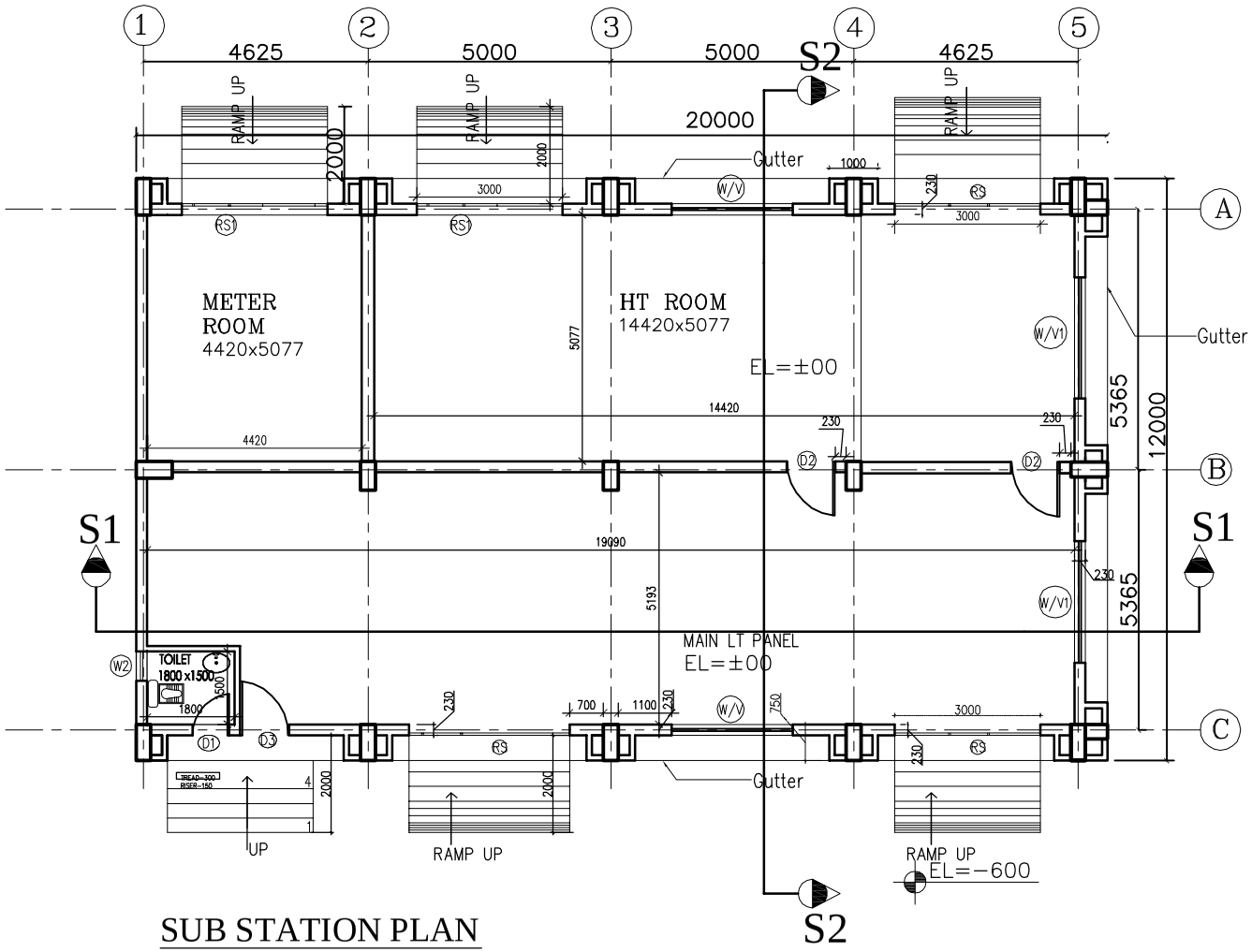
NEW DELHI INDIA



SUB STATION PLAN

NOTES

1.	D1	750 X 2100	000	2100	
2.	D2	1000 X 2200	000	2200	
3.	D3	1200x2200	000	2200	
4.	RS1	3000 X 3000	100	3000	
5.	V	12000600	3800	4400	
6.	V1	30000750	2000	3950	
7.	W1	2500X2300	900	2300	
8.	W2	600X1000	1200	2200	

REV	DATE	DESCRIPTION

REVISION

PROJECT

AIIMS HOUSING
BHUBANESWAR

TITLE

TENDER DRAWING
SUB-STATION

Ground Floor Plan

HSCC/ /006/TD/SS/039/R
Drawing No.

HSCC/263	1:50	Dec'11
Job No.	Scale	Date
App by	Rev. by	Prep. by

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NEW DELHI INDIA

END OF VOLUME-IV

Ministry of Health & Family Welfare
(GOVERNMENT OF INDIA)
Ministry of Health & Family Welfare
Nirman Bhavan, Maulana Azad Road
New Delhi – 110011

Tender for

Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)

Volume - V
BILL OF QUANTITIES (BOQ)

Tender No. HSCC/PMSSY/BHUBANESWAR/SS/2011

DECEMBER 2011

Consultant

HSCC (India) LTD.
(A Govt. of India Enterprise)
E-6A, Sector-1, Noida, U.P-201301
Phone: 0120-2542436-40, Fax: 0120-2542447
Website:http://www.hsccltd.com

Supply, Installation, Testing & Commissioning of 33KV Sub-station equipment including Construction of Substation Building of Housing Complex for AIIMS-like Institution under PMSSY at Bhubaneswar (Orissa)

BILL OF QUANTITIES

PROJECT: BILL OF QUANTITIES OF AIIMS HOUSING AT BHUBNESHWAR (33KV SUB STATION).							
S.No.		**Description.**	**Qty.**	**Unit.**	**Rate in Figures (in Rs.)**	**Rate in words (in Rs.)**	**Amount (in Rs.)**
1		**2**	**3**	**4**	**5**	**6**	**7**
		SUBHEAD: H.T. SUB STATION					
		SUBSTATION EQUIPMENTS					
1.00		**Sub Station -1**					
1.01		**HT Panel**					
		Supply, erection, testing and commissioning of indoor type HT Panel having 630A, 33 kV, 3 Phase, 50 Hz., metal clad, dead front, 18.4 KA rupturing capacity Vacuum Circuit Breakers with interlocking scheme for the operation of different VCB, connections etc. complete with following incomers and outgoings including interlocking as per technical spcifications and as required.					
	a	**INCOMER :**					
	i	***1No. VCB Panel having following***					
		1 No. 630A, 33 kV, 3 Phase, 50Hz., metal clad, dead front, 18.4 KA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB)					
		1 set of 33kV/110V Potential Transformers with HRC fuses for metering and protection.					
		1 Set of Phase indicating lamps with HRC fuses					
		1 No. 0-33 kV digital voltmeter with selector switch					
		1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY					
		2 No. Push button for CLOSE and TRIP					
		1 set of 100/5-5A Current Transformer for metering and protection or as required by state electricity board.					
		1 No. digital ammeter with selector switch					
		1 Set of CDG 61 (2 No. O/C, 1 No. E/F) relay					
		8 window Alarm annunciator with separate hooter, accept and rest push buttons.					
		I Set of undervoltage relay and Overvoltage relay					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		1 set of trip circuit supervision relay					
		Auxiliary Relay with shunt trip coil.					
		I No. Master Trip relay					
		1 No. digital Power factor meter					
		1 No. digital Frequency meter					
		1 No. 3-Phase digital Trivector Meter of suitable rating					
		BUSBARS :					
		33KV, 630 Amps, 18.4 KA Three Phase busbars of Copper.					
	b	**OUTGOINGS :**					
	i	***5 No. VCB Panels each having following***					
		1 No. 630A, 33kV, 3 Phase, 50Hz., metal clad, dead front, 18.4 KA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB)					
		1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY					
		Push buttons for CLOSE and TRIP					
		1 set of Current Transformer for metering and protection as per requirement.					
		1 set of 33kV/110V Potential Transformers with HRC fuses for metering and protection.					
		1 No. digital Amps ammeter with selector switch					
		1 Set of CDG 61 (2 No. O/C, 1 No. E/F) relay					
		I No. Master Trip Relay					
		1 set of trip circuit supervision relay					
		Auxiliary Relay with shunt trip coil.					
		8 window Alarm annunciator with separate hooter, accept and rest push buttons.					
		HT Panel as mentioned above.	1	Set			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
1.02		Four pole structure with GOD, AB switch/ D.O. fuse and lightening arresters etc with pin/ disc insulators of 33 KV grade complete with foundation of pole etc complete as per requirements of State Electricity Board and as required.	1	Set			
1.03		**TRANSFORMER**					
		Supply, erection, testing and commissioning of 1250 KVA, 33/0.433 kV, 3 Phase, 4 wire, 50 Hz., ON-AN Transformer for out door duty with an off load tap changer -7.5% and +5% in the steps of 2.5% with cable at primary (HT side) and secondary end (LT side) shall be connected through busduct, the transformer shall be complete with first filling of oil, with buchholz relay protection, high winding temperature sensors, complete with all fittings, interconnection of control cables and accessories, soak pit for transformer oil complete as per technical specifications including fencing, gate, pebbles etc as per state electricity rule and civil foundation as per manufacturers requirements.	2	Set			
1.04		***BUS DUCTS (Outdoor type)***					
	i)	Supply, Installation, testing and commissioning of **2000 A** phase and neutral TPN, 415 V, 3 Phase, 4 Wire, sandwich construction Aluminium Bus Duct including bends, flexible joints, earth bus (2 runs of aluminium strips), supports for installation, supporting arrangements, canopy etc. complete as per technical specifications and as required.	50	Mtrs			
1.05		**BATTERY CHARGER PANEL**					
		Supply, erection, testing and commissioning of110 V DC, 20 Amp battery charger panel complete with battery, control cabling etc. as per technical specifications and as required.					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Sealed Maintenance Free (SMF) batteries of 40 ampere hour capacity for above 33kV VCB panels in HT Panel Room of the building as specified above.					
		Boost and Trickle charger suitable for above items.					
		1 No. AC Voltmeter (0-500Volt)					
		I No. DC Voltmeter					
		I No. DC Ammeter					
		1 set of AC and DC indicating lamps					
		1 No. DC Battery charging position indicator					
		DC distribution board suitable for above application to incoming & outgoing MCBs include tripping, closing and indication etc.					
		Control cabling between DC Distribution panel to the HT panel of the Substation with suitable core 1.5 sqmm copper cable					
		Battery Charger as mentioned above.	2	Set			
1.06		***H.T. CABLE***					
		Supply of following sizes of 33 kV grade multicore aluminium conductor XLPE armoured and overall HRPVC seathed power cable as per IS : 7098.					
	i	3 Core, 240 sq mm	1000	Metre			
1.07		Supplying and making end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size 3 Core, XLPE aluminium conductor cable of 33kV grade as required.					
	i	240 sqmm indoor type	8	Each			
	ii	240 sqmm outdoor type	6	Each			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
1.08		Providing and laying of 150mm dia non pressure NP2 class (heavy duty) RCC pipe with colar joint with stiff mixture of cement (1 cement : 2 fine sand) including testing the joints,digging and back filling the trench etc. as required for laying of pipe to be laid 1100 mm below ground level.	600	Metre			
1.09		Laying of one number 33 kV, XLPE power cable of 3 core 240 Sqmm in RCC pipe of 150mm dia complete as required	1000	Metre			
1.10		Making of manhole size 1.5 m (depth) X 1.5 m(width) with suitable opening including manhole cover and monkey ladder complete as required.	12	Nos			
1.11		Supply & laying of 33 KV cable route marker of suitable location & internal.	30	Nos			
		Sub Station -2					
1.12		**HT Panel**					
		Supply, erection, testing and commissioning of indoor type HT Panel having 630A, 33 kV, 3 Phase, 50 Hz., metal clad, dead front, 18.4 KA rupturing capacity Vacuum Circuit Breakers with interlocking scheme for the operation of different VCB, connections etc. complete with following incomers and outgoings including interlocking as per technical spcifications and as required.					
	a	**INCOMER :**					
	i	***1No. VCB Panel having following:***					
		1 No. 630A, 33 kV, 3 Phase, 50Hz., metal clad, dead front, 18.4 KA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB)					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		1 set of 33kV/110V Potential Transformers with HRC fuses for metering and protection.					
		1 Set of Phase indicating lamps with HRC fuses					
		1 No. 0-33 kV digital voltmeter with selector switch					
		1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY					
		2 No. Push button for CLOSE and TRIP					
		1 set of 50/5-5A Current Transformer for metering and protection or as required by state electricity board.					
		1 No. digital ammeter with selector switch					
		1 Set of CDG 61 (2 No. O/C, 1 No. E/F) relay					
		8 window Alarm annunciator with separate hooter, accept and rest push buttons.					
		I Set of undervoltage relay and Overvoltage relay					
		1 set of trip circuit supervision relay					
		Auxiliary Relay with shunt trip coil.					
		I No. Master Trip relay					
		1 No. digital Power factor meter					
		1 No. digital Frequency meter					
		1 No. 3-Phase digital Trivector Meter of suitable rating					
		BUSBARS :					
		33KV, 630 Amps, 18.4 KA Three Phase busbars of Copper.					
	b	**OUTGOINGS :**					
	i	***4 No. VCB Panels each having following:***					
		1 No. 630A, 33kV, 3 Phase, 50Hz., metal clad, dead front, 18.4 KA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB)					
		1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY					
		Push buttons for CLOSE and TRIP					
		1 set of Current Transformer for metering and protection as per requirement.					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		1 set of 33kV/110V Potential Transformers with HRC fuses for metering and protection.					
		1 No. digital Amps ammeter with selector switch					
		1 Set of CDG 61 (2 No. O/C, 1 No. E/F) relay					
		I No. Master Trip Relay					
		1 set of trip circuit supervision relay					
		Auxiliary Relay with shunt trip coil.					
		8 window Alarm annunciator with separate hooter, accept and rest push buttons.					
		HT Panel as mentioned above.	1	Set			
1.13		**TRANSFORMER**					
		Supply, erection, testing and commissioning of 1000 KVA, 33/0.433 kV, 3 Phase, 4 wire, 50 Hz., ON-AN Transformer for out door duty with an off load tap changer -7.5% and +5% in the steps of 2.5% with cable at primary (HT side) and secondary end (LT side) shall be connected through busduct, the transformer shall be complete with first filling of oil, with buchholz relay protection, high winding temperature sensors, complete with all fittings, interconnection of control cables and accessories, soak pit for transformer oil complete as per technical specifications including fencing, gate, pebbles etc as per state electricity rule and civil foundation as per manufacturers requirements.	2	Set			
1.14		***BUS DUCTS (Outdoor type)***					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
	i)	Supply, Installation, testing and commissioning of **1600 A** phase and neutral TPN, 415 V, 3 Phase, 4 Wire, sandwich construction Aluminium Bus Duct including bends, flexible joints, earth bus (2 runs of aluminium strips), supports for installation, supporting arrangements, canopy etc. complete as per technical specifications and as required.	50	Mtrs			
		TOTAL FOR SUBHEAD 1: H.T. SUB STATION					
2.00		**SUB HEAD 2: MAIN LT PANEL**					
		MAIN LT PANEL - 1					
2.01		Supply, installation, testing and commissioning of LT Panel, cubicle type, totally enclosed, powder coated, free standing type, dust, damp and vermin proof Panel made up of 14 SWG CRCA sheet, complete with aluminium busbars, danger notice plate, interconnections with suitable capacity aluminum leads/solid aluminum strips/rods, necessary interlocking, and having incoming and outgoing switchgears as mentioned below and complete as required.					
		Note :					
		1. All ACBs shall have 5 NO + 5 NC contacts					
		2. All relays to operate at 240Volts, Single phase, 50Hz., AC supply throug UPS of suitable capacity. The UPS is also in the scope of supply.					
	A.	**INCOMERS**					
	i)	2 Nos ACB as per following details/ specification:					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		2000A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, under voltage and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		1 Set of restricted earth fault relay system including necessary CT etc. complete.					
		Digital multi function meter with one set of CTs, CT shorting links, R/Y/B LED indicating lamps and 2A cobntrol SP MCBs					
		Digital Energy Meter with necessay CT's etc.					
		Suitable CT with shorting links for power factor improvement panel suitable for giving signal to APFCR at less than 10% of secondary ratio current					
	ii)	2 Nos ACB as per following details/ specification:					
		400A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circui, under voltage release and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		Digital multi function meter with one set of CTs, CT shorting links, R/Y/B LED indicating lamps and 2A cobntrol SP MCBs					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
	B.	**BUS COUPLERS :**					
	i)	1 Nos .ACB as per following details / specification:					
		2000A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
	ii)	2 Nos .ACB as per following details / specification:					
		800A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
		BUSBARS :					
		2500 Amp FP busbars of aluminum					
	C.	**OUTGOINGS :**					
	i	**1 No. ACB Panels each having following:**					
		1000 A, 415/500V, Fully Motorised, Fully Drawout type (EDO), TPN, Air Circuit Breaker with microprocessor based overload, short circuit, instantaneous & earth Fault trip including under voltage release and loackable trip push button. ACB should have Icw=Ics= 50 KA for 1 sec.					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button to CLOSE the ACB					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	ii	7 Nos .MCCB as per following details / specification:					
		630 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	iii	2 Nos . MCCB as per following details / specification:					
		320 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	iv	6 Nos . MCCB as per following details / specification:					
		250 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O / L, S / C & E / F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	v	9 Nos . MCCB as per following details / specification:					
		100 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
	vi	14 Nos . MCCB as per following details / specification:					
		63 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	vii	3 Nos . MCCB as per following details / specification:					
		32 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
		UPS					
		A UPS of suitable capacity single phase input and single phase output, 240V 50 Hz AC online, with inbuilt 1 Hour battery back up in the form of sealed maintenance free (SMF) batteries with power wiring to the control bus for suply to relays.(UPS to be installed inside the LT panel.)					
		ENCLOSURE :					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Fabrication, PVC Sleeving, Control/Power Wiring and hardware					
		Interlocking between incoming breakers and buscouplers as per interlocking scheme with cabling, necessary hardware and auxiliary contacts					
		MAIN LT PANEL - 1 as mentioned above	1	Set			
		MAIN LT PANEL - 2					
2.02		Supply, installation, testing and commissioning of LT Panel, cubicle type, totally enclosed, powder coated, free standing type, dust, damp and vermin proof Panel made up of 14 SWG CRCA sheet, complete with aluminium busbars, danger notice plate, interconnections with suitable capacity aluminum leads/solid aluminum strips/rods, necessary interlocking, and having incoming and outgoing switchgears as mentioned below and complete as required.					
		Note :					
		1. All ACBs shall have 5 NO + 5 NC contacts					
		2. All relays to operate at 240Volts, Single phase, 50Hz., AC supply throug UPS of suitable capacity. The UPS is also in the scope of supply.					
	A.	**INCOMERS**					
	i)	2 Nos ACB as per following details/ specification:					
		1600A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, under voltage release and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		1 Set of restricted earth fault relay system including necessary CT etc. complete.					
		Digital multi function meter with one set of CTs, CT shorting links, R/Y/B LED indicating lamps and 2A control SP MCBs					
		Digital Energy Meter with necessay CT's etc.					
		Suitable CT with shorting links for power factor improvement panel suitable for giving signal to APFCR at less than 10% of secondary ratio current					
	ii)	2 Nos ACB as per following details/ specification:					
		400A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, under voltage release and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		Digital multi function meter with one set of CTs, CT shorting links, R/Y/B LED indicating lamps and 2A control SP MCBs					
	B.	**BUS COUPLERS :**					
	i)	1 Nos .ACB as per following details/ specification:					
		1600A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit and earth fault release					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
	ii)	2 Nos .ACB as per following details / specification:					
		800A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=50kA), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit and earth fault release					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button for CLOSE and TRIP with lock and key arrangement.					
		BUSBARS :					
		2000 Amp FP busbars of aluminum					
	C.	**OUTGOINGS :**					
	i	**1 No. ACB Panels each having following:**					
		1000 A, 415/500V, Fully Motorised, Fully Drawout type (EDO), TPN, Air Circuit Breaker with microprocessor based overload, short circuit, instantaneous & earth Fault trip including under voltage release and loackable trip push button. ACB should have Icw=Ics= 50 KA for 1 sec.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Push button to CLOSE the ACB					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
	ii	**2 Nos .ACB as per following details/ specification:**					
		400 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	iii	**5 Nos . MCCB as per following details/ specification:**					
		320 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	iv	**4 Nos . MCCB as per following details/ specification:**					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		250 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	v	**11 Nos . MCCB as per following details/ specification:**					
		100 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	vi	**12 Nos . MCCB as per following details/ specification:**					
		63 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
	vii	**3 Nos . MCCB as per following details/ specification:**					
		32 Amp 415 volts, 50 KA (Isc), TPN MCCB with thermal magnetic release having variable current settings .					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB					
		Digital Ampere Metre of suitable range with suitable set of CT's and ASS.					
		Digital energy metre with CT					
		UPS					
		A UPS of suitable capacity single phase input and single phase output, 240V 50 Hz AC online, with inbuilt 1 Hour battery back up in the form of sealed maintenance free (SMF) batteries with power wiring to the control bus for suply to relays.(UPS to be installed inside the LT panel.)					
		ENCLOSURE :					
		Fabrication, PVC Sleeving, Control/Power Wiring and hardware					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		Interlocking between incoming breakers and buscouplers as per interlocking scheme with cabling, necessary hardware and auxiliary contacts					
		MAIN LT PANEL - 2 as mentioned above	1	Set			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		CAPACITOR PANELS :					
		CAPACITOR PANEL - 1 (For MAIN LT - 1)					
2.03		Supply, installation, testing and commissioning of M.V. cubicle type totally enclosed, powder coated free standing type, dust, damp and vermin proof Capacitor Panel complete with busbars, M.V. danger notice plate, ammeter, ammeter selector switch, indicating lamps, CT's, Extra heavy duty Capacitors suitable for non linear loads upto 20% (L&T model MD-XL or equivalent), contactors suitable for capacitor switching (current limiting contactor circuit to suppress switching inrush current) 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					
	A.	**INCOMER :**					
		630 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP.					
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		10 steps Intelligent microprocessor based Automatic Power factor Correction relay having measurment sensitivity of 1 %.					
		Extension of incoming busbars for connection of multicore armoured aluminium cables.					
	B.	**METERING :**					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		1 set of digital Amp. Meter, digital Poper factor meter and Digital voltmeter					
	C.	**BUSBARS :**					
		800 Amp FP busbars of aluminum					
	D.	**OUTGOINGS :**					
	i)	1 Nos . MCCB as per following details / specification:					
		200 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current.					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		100 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
	ii)	**4 Nos . MCCB as per following details/ specification:**					
		100 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		50 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
	iii)	2 Nos . MCCB Panel consisting of the following					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		63 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		25 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
	iv)	2 Nos . MCCB Panel consisting of the following					
		32 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		10 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
		Capacitor Panel - 1 as mentioned above	2	Set			
		CAPACITOR PANEL - 2 (For MAIN LT - 2)					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
2.04		Supply, installation, testing and commissioning of M.V. cubicle type totally enclosed, powder coated free standing type, dust, damp and vermin proof Capacitor Panel complete with busbars, M.V. danger notice plate, ammeter, ammeter selector switch, indicating lamps, CT's, Extra heavy duty Capacitors suitable for non linear loads upto 20% (L&T model MD-XL or equivalent), contactors suitable for capacitor switching (current limiting contactor circuit to suppress switching inrush current) 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					
	A.	INCOMER :					
		400 Amp 415 volts, 50 KA (Ics), TPN microprocessor based MCCB with variable current settings and having microprocessor based O/L, S/C & E/F protection release.					
		Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.					
		Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP.					
		R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs					
		10 steps Intelligent microprocessor based Automatic Power factor Correction relay having measurment sensitivity of 1 %.					
		Extension of incoming busbars for connection of multicore armoured aluminium cables.					
	B.	**METERING :**					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		1 set of digital Amp. Meter, digital Poper factor meter and Digital voltmeter					
	C.	**BUSBARS :**					
		800 Amp FP busbars of aluminum					
	D.	**OUTGOINGS :**					
	i)	2 Nos . MCCB as per following details / specification:					
		100 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		50 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
	ii)	3 Nos . MCCB Panel consisting of the following					
		63 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		25 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
	iii)	3 Nos . MCCB Panel consisting of the following					

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
		32 Amps, 415 volts, TP, Power Contactor suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current					
		ON / OFF delay timers for switching capacitor circuit.					
		"ON" and "OFF" LED indicating lamp and 2A control SP MCBs					
		Push button for CLOSE and TRIP					
		Extended rotary operating mechanism					
		10 kVAR super heavy duty mix dielectric low loss Capacitors suitable for non linear loads upto 20% (L&T model MD-XL ultra or equivalent)					
		Capacitor Panel - 2 as mentioned above	2	Set			
		TOTAL SUBHEAD 2: MAIN LT PANEL :					
		SUB HEAD 3: LT CABLES					
3.00		**LT CABLES**					
3.01		Supply of following sizes of 1.1 kV grade multicore aluminium conductor PVC sheathed armoured AYFY cable as per IS 1554.					
	i	2 Core 6 Sq mm	1000	Metre			
	ii	3.5 Core 25 Sqmm.	2426.4	Metre			
	iii	3.5 Core 35 Sqmm.	468	Metre			
	iv	3.5 Core 50 Sqmm.	768	Metre			
	v	3.5 Core 95 Sqmm.	1363.2	Metre			
	vi	3.5 Core 120 Sqmm.	1364.4	Metre			
	vii	3.5 Core 300 Sqmm.	500	Metre			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
3.02		Laying of one number PVC insulated and PVC sheathed power cable 1.1kV grade direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc. as required					
	i	Size not exceeding 25 sq.mm	1000	Metre			
	ii	Size exceeding 25 sq.mm but not exceeding 120 sq.mm	500	Metre			
	iii	Size exceeding 120 sq.mm but not exceeding 300 sq.mm	200	Metre			
3.03		Laying of one number PVC insulated and PVC sheathed power cable 1.1kV grade direct in the existing RCC/ Hume/Stoneware/Metal pipe as required					
	i	Size not exceeding 25 sq.mm	30	Metre			
	ii	Size exceeding 25 sq.mm but not exceeding 120 sq.mm	30	Metre			
	iii	Size exceeding 120 sq.mm but not exceeding 300 sq.mm	30	Metre			
3.04		Laying of one number PVC insulated and PVC sheathed power cable 1.1kV grade on surface or on existing cable tray complete as required.					
	i	Size not exceeding 25 sq.mm	100	Metre			
	ii	Size exceeding 25 sq.mm but not exceeding 120 sq.mm	100	Metre			
	iii	Size exceeding 120 sq.mm but not exceeding 240 sq.mm	100	Metre			
3.05		Supplying and making end termination with brass double compression glands of following sizes of 1.1. kv grade multicore aluminium conductor PVC insulated and PVC sheathed					
	i	2 Core 6 Sq mm	130	Each			
	ii	3.5 Core 25 Sqmm.	34	Each			
	iii	3.5 Core 35 Sqmm.	4	Each			
	iv	3.5 Core 50 Sqmm.	4	Each			
	v	3.5 Core 95 Sqmm.	22	Each			
	vi	3.5 Core 120 Sqmm.	24	Each			
	vii	3.5 Core 300 Sqmm.	8	Each			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
3.06		Fabricating and installing following size of perforated M.S. cable trays including horizontal and vertical bends, reducers, tees, cross members and other accessories as required and duly suspended from the ceiling with M.S. suspenders and including painting etc. as required :-					
	i	150 mm. width x 50 mm. depth x 1.6 mm. thickness	30	Metre			
	ii	300 mm. width x 62.5 mm. depth x 2.0 mm. thickness	50	Metre			
	iii	450 mm. width x 62.6 mm. depth x 2.0 mm. thickness	15	Metre			
	iv	600 mm. width x 62.6 mm. depth x 2.0 mm. thickness	10	Metre			
		TOTAL SUBHEAD 3: LT CABLES :					
		SUB HEAD 4: EARTHING SAFETY EQUIPMENT AND MISC. ITEMS					
4.00		**EARTHING, SAFETY EQUIPMENTS AND MISC. ITEMS**					
4.01		Earthing with Copper plate 600mmX600mmX3mm thick including accessories, and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc. (but without charcoal or coke and salt) complete as per CPWD general specifications for electrical works Part-1, Internal - 2005 and IS:3043-1987.	12	Set			
4.02		Earthing with GI plate 600mmX600mmX6mm thick including accessories, and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc. (but without charcoal or coke and salt) complete as per CPWD general specifications for electrical works Part-1, Internal - 2005 and IS:3043-1987	16	Set			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
4.03		Extra for using charcoal and salt for GI or copper plate earth electrode as required.	28	Set			
4.04		Supplying and laying 50mmX6mm Copper strip on surface/on existing cable trench/RCC pipe or in recess for earth electrode as required.	100	Metre			
4.05		Providing and fixing 50mmX6mm GI strip on surface/on existing cable trench/RCC pipe or in recess for earth electrode as required.	300	Metre			
4.06		Providing and fixing 25mmX5mm GI strip on surface/on existing cable trench/RCC pipe/GI pipe or in recess for earth electrode as required.	100	Metre			
4.07		Providing and fixing H.T. (33kV) danger notice plate of 250mmX150mm made of mild steel, atleast 2mm thick and vitreous enameled white on both sides and with inscription in signal red colour on front side as required.	4	Each			
4.08		Supplying and laying of 33KV grade 1 metre wide anti skid chequered type rubber mat.	40	Metre			
4.09		Design, manufacture, supply and installation of Fire Buckets 13 litre capacity 4 Nos. duly filled with sand and GI pipe support stand for these buckets with 14 guage MS paintedsheet etc. complete as required ans as per fire safety norms.	6	Set			
4.10		Supply and fixing shock treatment chart in English, Hindi and local language mounted on 5mm thick Plywood and 3mm thick plain glass front complete as required.	4	Set			

S.No.		Description.	Qty.	Unit.	Rate in Figures (in Rs.)	Rate in words (in Rs.)	Amount (in Rs.)
1		2	3	4	5	6	7
4.11		Supplying and fixing CO2 type 9 Kg capacity fire extinguishers as approved by ISI complete as required.	8	Set			
4.12		Supplying, storing, handling and fixing in position First Aid Medical Box complete as per tech. specifications as required.	2	Each			
		TOTAL SUB HEAD 4: EARTHING, SAFETY EQUIPMENT AND MISC. ITEMS					
		GRAND TOTAL FOR ALL ELECTRICAL WORKS					

SUMMARY OF COST ESTIMATE - ELECTRICAL WORKS

S.No.	Description	Amount In Figure (In Rs.)	Amount in Words (Rs.)
1	**SUBHEAD 1: H.T. SUB STATION**		
2	**SUB HEAD 2: MAIN LT PANEL**		
3	**SUB HEAD 3: LT CABLES**		
4	**SUB HEAD 4: EARTHING SAFETY EQUIPMENT AND MISC. ITEMS**		
	GRAND TOTAL FOR ALL ELECTRICAL WORKS		

END OF VOLUME-V