

Medical Education & Drugs Department, Mumbai
GOVERNMENT OF MAHARASHTRA

NOTICE INVITING RATES

Tender no: HSCC/Estimation/Chandrapur/2018

Dated: 16.10.2018

HSCC (India) Limited on behalf of Medical Education & Drugs Department, Government of Maharashtra invites online rates for the enclosed items for estimation purpose for the following works:

Name & Description of work	Last date of submission of rates
Design, Engineering, Procurement & Construction of 150 Students Medical College and 700 bedded Hospital and allied building works at Chandrapur, Maharashtra	26.10.2018.

List of items for estimation purpose and other details are available online from **18.10.2018** at **HSCC website** <http://www.hsccltd.co.in> and Govt. of Maharashtra website <https://pwd.maharashtra.etenders.in>

Prospective vendor/supplier/agencies may submit their rates of list of items on sealed envelope mentioned name & description of work on the envelope so as to reach our office on or before 26.10.2018 on below mentioned address:

Chief General Manager (PG-I)
M/s HSCC (India) Ltd
E-6A, Sctor-1, Noida-201301 (U.P)

Prospective agencies/ firms are advised to regularly scan through HSCC website <http://www.hsccltd.co.in> as corrigendum/amendments etc., if any, will be notified on this portal only.

CGM (PG-I)
HSCC (India) Ltd.

NAME OF WORK: Construction of Medical College, Hospital, Hostels and Residences at Chandrapur, Maharashtra

CIVIL WORK						
S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
1	2	3	4	5	6	7
1.00	Supplying at site of fully insulated wooden fire rated shutter of 120min. fire rating conforming to BS: 476 part 22 and IS:3614 Part II as per the prototype tested and certified by CBRI Roorkee, of minimum 50 mm thickness, comprising of 75mm x 44mm hardwood internal timber frame work, with infill of 96 kg/m ³ , ceramic fiber blankets, coated with intumescent coating on both sides for insulation. The coated insulation shall be sandwiched between 12mm thick, Non combustible Boards (Calcium Silicate of approved quality and manufacture) on both sides (edge to edge on internal Hardwood frame) and clad with 3mm thick commercial ply of approved quality & 1mm thick laminate of approved brand and manufacture on both sides, with 50mm x 14mm 2nd class teak wood lipping all round the shutter.					
	The shutter is suitable for mounted on the door frame, as per the item given below. Both frame and shutter shall be fitted with fire & smoke intumescent seal of Viper or equivalent make of size 20 x 4mm on all the three sides except bottom. The pasting of the ply/veneer/laminate should be done using automatic machine and should be free from any nails or perforations. The board shall be Resistant to vermin, mould growth, minor impact, abrasion and short term water attack. The shutter shall be fixed with the frame with the help of SS 304 grade ball bearing hinges of size 100x75x3mm of approved quality with necessary screws and making cut out for vision panel. Provisions/reinforcement for fixing all fixtures shall be built in on the door prior to the supply. The rate shall include all the materials, labour and T&P for the works described in the item above. (Make: Navair, Pacific, Sukriti)-Single/Double Shutter					
a)	Rate for supply of above item	1947.00	Sqm			
b)	Rate for installation of above item	1947.00	Sqm			
2.00	Supplying at site door frames as per BS: 476 part 22, IS:3614 Part II as per the prototype certified by CBRI Roorkee made out of 2nd class Teak Wood (Ivory Coast)frame of section 120 X 70 mm for fire resistant doors of 120 minutes fire rating, with heat activated intumescent fire seal strips of size 20 x 4 mm(for smoke sealing) provided in grooves on all three sides of the frame with one coat of approved brand of fire retardant primer including two coats of fire retardant paint FR 881or equivalent un thinned on cleared hard wood surface of door frames (@3.5 sq.m. per litre per coat) including preparation of base surface as per recommendations of manufacturer to make the surface fire retardant, including fixing the frame with 8 nos. 100 mm long, 10 mm dia metal dash fastners complete as per directions of the Engineer in charge NOTE:- cost of fire seal strips, dash fastners are included in the item. Nothing extra shall be paid if size of any component of material exceeds the limit mentioned in the item to achieve desired fire rating. (Make: Navair, Pacific, Sukriti)					
a)	Rate for supply of above item	3107.00	Mtr			
b)	Rate for installation of above item	3107.00	Mtr			
3.00	Supplying and fixing UL listed door Co-ordinator of approved Make for coordination of double leaf 120 min fire rated doors, of approved brand and manufacture. (Make: Dorma, D-Line, Briton, Becker FS)					
a)	Rate for supply of above item	274.00	Each			
b)	Rate for installation of above item	274.00	Each			

NAME OF WORK: Construction of Medical College, Hospital, Hostels and Residences at Chandrapur, Maharashtra**CIVIL WORK**

S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
4.00	Supply & fixing of Fire-stop Fire sealing System Board Type(barriers) of approved make for sealing of floors, wall openings under control panels for the purpose of compartmentation.The FPSS consists of 100mm thick mineral wool insulation pad of approved make having density of 48 kg/m3 coated with FR in tumescent compound encased with 10 mm thick calcium silicate board of approved make, sealed with intumescent Fire Seal Putty of approved Make. The system is coated and fixed with openings with the help of slotted angles of size 40x40mm of 16 SWG thickness, nutbolts of size 1.5"x8mm Dia. The FPSS system all provide 2 hours fire rating as per IS 12458-1989.After insulation of this system it will be painted with Fire Retardant Paint of approved Make. (Make: Navair, Pacific, Sukriti)	411.00	Sqm			
5.00	Providing & fixing 11.0 mm thick sandwich clear glass of approved make tested upto 2 hours fire rating and complied with BS 476: Part 22 as vision panel including cost of fire rated ceramic tape and moulding/beading all complete.(Make: Saint Gobain, Pilkington, Schott, Pyroguard)					
a)	Rate for supply of above item	101.00	sqm			
b)	Rate for installation of above item	101.00	sqm			
6.00	Providing and fixing of UL listed fire rated single/double leaf panic exit devices tested in accordance with BS EN 1125: 1997 & BS EN 179: 1997, EN 1670 (Corrosion Resistant), & BS 476 Part 22 (for fire rating) with min. one year warrantee.(Make: Dorma, D-Line, Briton, Becker FS)- Double Leaf Panic Bar Set					
a)	Rate for supply of above item	280.00	Each			
b)	Rate for installation of above item	280.00	Each			
7.00	Providing and fixing of heavy duty door closer of approved quality for 120 min fire door in accordance with BS:476 Part 22 for fire rating and BS EN 1154 with minimum one year warranty.(Make: Dorma, D-Line, Briton, Becker FS)					
a)	Rate for supply of above item	411.00	Each			
b)	Rate for installation of above item	411.00	Each			
8.00	Providing and fixing fire rated mortice lock with lever handle with 80 mm long cylinder of approved manufacturer for 120 min fire reated door.(Make: Dorma, D-Line, Briton, Becker FS)					
a)	Rate for supply of above item	246.00	Each			
b)	Rate for installation of above item	246.00	Each			
9.00	Providing and fixing 300 mm long stainless steel grade 304 D type back to back pull handle of approved make with necessary bolts with alen key arrangement etc complete for 120 min fire rated door.(Make:D-Line, Dorma, Dorset, Giesse, Ozone, Hettich, Hafele)					
a)	Rate for supply of above item	477.00	Each			
b)	Rate for installation of above item	477.00	Each			
10.00	Supply & installation of Panic Trim of approved brand & manufacture for 120 min.fire rated door.(Make: Dorma, D-Line, Briton, Becker FS)					
a)	Rate for supply of above item	50.00	Each			
b)	Rate for installation of above item	50.00	Each			
11.00	Sensor Sliding Door					

NAME OF WORK: Construction of Medical College, Hospital, Hostels and Residences at Chandrapur, Maharashtra

CIVIL WORK						
S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
	Supplying at site automatic sliding door operator of approved brand and manufacture for a door of clear passage width ranging from 2500-3000 mm consisting of 6.25 mtr long operator with track profiles, glass clamping rails, floor guide, Radar eagle 6 sensors, 5 programme switch with knob, light barrier EM lock and cable for programme switch all complete of approved brand and quality, complete to the satisfaction of engineer in charge. nothing extra is payable if some civil work is required for fixing of the system.(Cost of door/ glass to be paid seperately)					
a)	Rate for supply of above item	2.00	Each			
b)	Rate for installation of above item	2.00	Each			
12.00	S/F 12 mm thick toughened glass in the item of sensor door (Make: Saint Gobain, Asahi, Pilkington, Glaverbel, Modi Guard)					
a)	Rate for supply of above item	20.00	Sqm			
b)	Rate for installation of above item	20.00	Sqm			
13.00	Supplying at site 19 mm thick non-decorative core of BWP block board (Durobord/ Greenply/century or equivalent) with frame of 1st class hard wood & well matched commercial 3 ply veneering with vertical grains or cross bands & face veneers on both faces					
		4110.00	sqm			
14.00	P/L 8mm thick (EN13329) HDF laminated wooden Flooring including skirting of approved brand and manufacture(class use of 31/33 AC 4 plank size 1290 X 194 mm & groove construction with edge impregnate with seal to secure long lasting joints ,secured together with the help of suitable glue, conforming to EN 13329 including the cost of 0.6 mil. PE Film and 2 mm PU Foam with accessories like Skirting, T Profile, beading, stair nose etc all complete. (Make: Pergo, Armstrong, Greenpanel).					
a)	Rate for supply of above item	2652.00	Sqm			
b)	Rate for installation of above item	2652.00	Sqm			
15.00	Providing and applying 2mm thick self smoothening epoxy based with 100% solid content conductive/Dissipative flooring system with minimum 50N/mm ² compressive strength and 28N/mm ² Flexural Strength as per BS 6319 having surface resistance of 25 x 10 ³ - 1 x 10 ⁶ Ohms in case of Conductive floor and x 10 ⁶ - 1 x 10 ⁹ Ohms in case of dissipative floor as per ASTM F 150.(Make: Fosroc, BASF, STP, Sika, Dr Beck).					
a)	Rate for supply of above item	1338.00	Sqm			
b)	Rate for installation of above item	1338.00	Sqm			
16.00	Providing and fixing 10mm thick clear multi wall solar control polycarbonate sheets of approved quality and shade in desired shape in roofing including the cost of EPDM gaskets , sealing tape , aluminium profile and all necessary accessories complete as per architectural drawings and as directed by Engineer incharge. The item includes designing the complete system and supplying & getting approved from client and / or reputed engineering institue like IIT etc. The detailed shop drawings including supplying structural design calculations based on relevent codal provisions and carrying out water penetration test as per standards followed in India.					
	The whole work is to be done through reputed and approved vendor having experience in polycarbonate work in Commercial/ Govt/ Corporate buildings as per architectural elevation drawings including filling of joints with silicon sealent and also with masonary/ RCC work, at all heighths including double heights, straight or curved etc. complete in all respect. (Surface Area shall be measured for the payment) (M.S. Framing to be paid for seperately)..					
a)	For Dome Structure					
a)	Rate for supply of above item	255.00	Sqm			
b)	Rate for installation of above item	255.00	Sqm			

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CIVIL WORK						
S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
17.00	Providing mixing and laying two component prepacked, water dispersed polyurethane resin system. The cured fi lm forms a hard, flexible, matt surface on concrete and other cementitious substrates. The total dry fi lm thickness shall be of 90 microns in two coats. It has volume solids 45%, Mixed density 1.20 ± 0.03, Pencil hardness (ASTM D3363)≥ 2H, Impact resistance (ASTM D 2794) (cm.kg) ≥ 50, Abrasion resistance (ASTM D 4060) (1000g, 1000 cycles)(CS10 wheel) < 35mg.(Make: Fosroc, Pidilite, Cico, BASF, Sika, Berger, Nerolac).					
a)	Rate for supply of above item	1579.00	Sqm			
b)	Rate for installation of above item	1579.00	Sqm			
18.00	Providing & fixing Classique Invincible Toilet Cubicle of approved make of sizes as per drawing which includes 600 mm door size width made of heat, bacteria, water, chemical ,scratch, impact and anti bacterial resistant 12 mm thick solid compact laminate panels (tested by Shriram Test House or equivalent approved laboratory). Finish of the compact laminate should be Suede/*Raw Silk or as approved by the engineer in charge, which includes door, pilasters & intermediate panels finished with approved texture/shade as per the details drawings & as per IS 2046 (Indian Standard) and as per fire retardant BS-476/97 Standard.					
	The item also includes providing and fixing in position necessary hardware made out of Stainless steel (Grade 304) as per manufacturer's specification & as approved by the Architect/ Engineer, like (1) Door Knop, (2) Gravity Hinges, (3) Thumb turn lockset indicators, (4) Coat hooks, (5) U- Channels, (6) SS-Shoe Box Plate (7) MS- Base Plate, (8) Top rail with Corner conntector (9) Rubber noise deafening tape (10) Screw & wall Plugs etc all complete to the satisfaction of engineer in charge.					
	The top fitting should consist of SS round top rail which will get fixed with pilasters,with SS panel tube holder, SS corner bend (connected with top rail) will be used on the corner of cubicle in absence of brick wall, SS wall fixing is used on the wall which will hold the SS top rail. All screws will be of 304 Grade stainless steel with satin finish. All pilasters are supported by stainless steel bottom cladding.The base of stainless steel botoom cladding will be anchored to floor with a clearance height upto 110 mm. (Surface area of partitions including door shall be measured for payment. The quoted rate should be for the complete item and nothing extra is payable in this account. (Make: GreenlamSturdo, Merino, Trespa).					
a)	Rate for supply of above item	930.00	Sqm			
b)	Rate for installation of above item	930.00	Sqm			
19.00	Providing fabricating and fixing of signages of varying sizes and shapes using three mm thick PVC sheet at base with self adhesive coloured vinyl with graphics on top of glow tape complete including fixing on wall with screws and washers or hanging on ceiling with GI chain/GI Bar complete as per technical specifications and directions of Engineer.	50000.00	Sqcm			
20.00	Providing and fixing of sinages of varying sizes and shapes using stainless steel sheet of minimum 16G thickness brush finish including engraving/etching of letters of required size filled with colour as desired by engineer,fixing with ss screws on walls.	200000.00	Sqcm			
21.00	Providing & fixing of EDGELIT signage with battery back up made from acrylic sheet of 8 mm thickness laser engraved, transformer to be inbuilt Maintenance-free sealed nickel cadmium battery including • 120V/277V AC Operation • Crystal clear acrylic • Engraved letters increase visibility • Anodized aluminum faceplate • Field applied chevron directional indicators simplify installation • Energy-saving LED lamps • UL listed	10000.00	Sqcm			

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S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
22.00	Providing, fabricating installation and fixing of LED LIT glass finish SS & acrylic letters sides made of 20 gauge SS 304 sheet of required size and shape with neatly fabricated joints properly welded and grinded with all corners rubbed and polished and top made of white imported acrylic sheet with bright white LEDs inside with arrangement of screws in the letters itself for mounting on the walls including cost of screws and fixing complete as per directions of engineer. (max length and max height of each letter to be used for finding area)	10000.00	Sqcm			
23.00	Providing, fabricating and fixing of LED signages made from acrylic 2 sheets + LED strips & power supply with the message print out and stainless steel studs on the walls including cost of screws and fixing complete as per directions of engineer.	10.00	Sqm			
24.00	Providing and fixing 3M quality frosting film for glass doors computer cut in designs approved and pasted. As per the directions of engineers.	10.00	Sqm			
25.00	Providing. Fabricating and fixing of Aluminium Composite Panel Signages with 3mm thick ACP Sheet, using 25X25 mm MS pipe Frame of approved quality with anti rust coating, back with G.I. and 5 Sides with ACP Sheet (alucobond or equivalent approved make), lettering to be done with 5mm Acrylic Sheet and Vinyl's(if Needed), backlit with (Philips or approved equivalent) Slim Lite Tube light Fittings, Acrylic Letters to Protrude out and be lit, together with a timer for switching on and off automatically at night and day including transportation and fixing at site as per the direction of the site engineer.	10.00	Sqm			
26.00	Providing. Fabricating and fixing of ACP DUAL SIDED TOWER ACP Signages with 3mm ACP Sheet, using 25X25 mm MS pipe frame of approved quality with anti Rust Coating, All 4 Sides with ACP Sheet Alucobond or equivalent make), Lettering to be done with raised 25mm Acrylic letters made from 3mm acrylic sheet and Vinyl's (if Needed), backlit with Philips or equivalent approved Slim Lite Tube light Fittings, Acrylic Letters to Protrude out and be lit, including transportation and fixing at Site as per the direction of engineer in charge. All Acrylic used should be of A-cast grade and vinyle of 3M quality, Electrical Philips Electronic or equivalent, with timer for auto on and off	20.00	Sqm			
27.00	Providing & Fixing Wall Mounted Nonlit Fire Exit 61 cm x 23 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	300.00	Each			
28.00	Providing & Fixing Wall Mounted Nonlit Utility 15x15 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	300.00	Each			
29.00	Providing & Fixing Wall Mounted Nonlit Identification sign 46x12.5 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	300.00	Each			

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CIVIL WORK						
S.No.	Description Of Item	Qty	Unit	Rate (excluding GST) in Rs	Amount (Rs) excluding GST	Rate of GST (%)
30.00	Providing & Fixing Wall Mounted Nonlit Identification sign 46x12.5 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	300.00	Each			
31.00	Providing & Fixing Wall Mounted Nonlit Utility 61x23 cm Internal sign of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	100.00	Each			
32.00	Providing & Fixing Wall Mounted Nonlit directory sign 305x122 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	100.00	Each			
33.00	Providing & Fixing Wall Mounted Nonlit directory sign 91x61 cm of approved make & made of 10mm Acrylic with the required text matters stuck on it with plotted self adhesive vinyl & Mounted on 3mm Aluminium Composit Panel bracketed at suitable locations including necessary fittings & fastening etc. complete & as directed by The Engineer in charge.	100.00	Each			
34.00	Providing and installation of SOLAR ROAD STUDS Self-Illuminating in dim Areas of during night time. Solar Rechargeable batteries for Continual Performance Without Much Maintained Super bright LEDs with a viewing Distance of 500-800 meters. Equipped with Prismatic reflective lens on each side ensure maximum reflectivity made up of highly compressive material, can sustain 10 tonnes. Water Resistant (Aluminum alloy and Polycarbonate 6 Led with stem)Self 20 green for entry and 20 Red for exit	500.00	Each			
35.00	Providing and Installation of CAR STOPPER Color: Black with yellow Reflective Strip Feet With help of fasteners (2 reflectors on Each Stopper) L-500 MM H-100M B-125 MM Weight-4.8 Kg.	20.00	Each			
36.00	Providing and installation of CAT EYE OF 3M QUALITY Designed to provide Enhanced, Dependable road Guidance to motorists , These are Visible From long Distance. These are installed With Special hot Melt Bitumen Adhesive Avoiding Nails ETC. (ABS Cat's Eye 90x110x17MM, Conforms ASTM Standards)	50.00	Each			

Name of Work : - Quotation Rates for Construction of proposed Hospital, Medical college, Medical College Labs, Library & Admin, Type-II, Type-III, Type-IV, Type-V, Director bungalow, UG Hostel (Male), UG Hostel (Female), Intern Hostel, Residents Hostel, Dinning-I, Dinning-II, Mortury, IMA Office & ESS Block at Chandarpur, Maharashtra- Plumbing.

Code No	Item Description	Unit	Total Qty.	Supply Only			Installation, Testing & Commissioning		
				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
	MARKET RATE (SANITARY FIXTURES)								
NS -1	Extra for providing & fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/ 6 litre (adjustable to 4 litre/ 8 litres) in place of push valve concealed type with cover plate 32mm size of JAQUAR or other equivalent model as per approved make list attached)	Number	925						
NS-2	Providing and fixing health faucet with pipe and hook complete (Roca model no. RF9060A1 or other equivalent model as per approved make list attached)	Each	1045						
NS-3	Extra for providing and fixing Sentronic Concealed Urinal Sensor Powered by 220 volts-AC. Concealed box dimension: 110x110x92 mm Front plate dimension :120 x120 mm in place of pressmatic urinal valve. code RT5X9215E00 from roca or other equivalent model as per approved make list attached)	Each	210						
NS -4	P&F wall Soap Holder with brackets' , complete fittings of roca or other equivalent approved make (Jaquar or other equivalent model as per approved make list attached)	Each	570						
NS-5	Providing and fixing Liquid Soap Dispenser all complete (Roca model No. RA 816070105 or other equivalent model as per approved make list attached)	Each	340						
NS -6	providing & fixing double robe hook with all complete fittings(Jaquar or other equivalent model as per approved make list attached)	Each	902						
NS -7	Supply and Installation of Grab Bar S, type-304, 18-gauge (1 mm) stainless steel tubing with satin-finish. 1-1/2" (25.4mm) outside diameter. Concealed Mounting Flanges — 18-8 S, type-304, stainless steel plate; end flanges with two holes for attachment to wall. Snap Flange Covers — 18-8 S, type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. Each cover snaps over mounting flange to conceal mounting screws. Make - Euronics or equivalent - 600mm (L) or other equivalent model as per approved make list attached	Each	349						
NS-8	Supply and Installation of Swing Grab Bar 18-8 S, type-304, 18-gauge (1mm) stainless steel tubing with satin-finish. 1-1/4 (25mm) outside diameter. Ends are heliarc welded to flanges. Backplate - 18-8 S, type-304, 3/16" (5mm) thick, satin-finish stainless steel with four screw holes for attachment to wall. Make - Euronics - EGRS 02 or other equivalent model as per approved make list attached	Each	349						
NS-9	Providing & fixing SS body solid state fully hygienic no touch Hand Drier of approved make rated for continuous repeat usage with solid state time delay LSF protection, with independent ambient light level & seasonal control temperatures including providing necessary C.I./M.S. brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, wiring cables from drier to plug, plug tops etc. complete including cutting and making good the walls wherever required. other (equivalent model as per approved make list attached.	Each	170						
NS-10	Providing and fixing Hospital S S 304 -18 SWG (thickness 2.0 mm) bed pan sink with P trap, size 850W x 600Dx300Hmm + SPL with 10 litres PVC. flushing cistern , 32 mm dia flush pipe cpvc , C.I./M.S. bracket with painting with 3 coats of white paint complete with accessories, C.P. brass long body bib cock and health fucet fittings (CMP.METAL,VIJAYA, MPS) or other equivalent model as per approved make list attached)	Each	25						
NS-11	Supply , installation, testing and commissioning of compact floor mounted pedestal base surgical scrub sink tailor made to suit the site available compatible with all the regular and standard plumbing system, with inbuilt geyser designed for use in operation theatre fabricated from thickness 1.6 mm 304 type stainless steel seamless 304 welded,polished to satin finish including connecting to drainage and water points and making good cutting of walls and floor surface all complete and as directed (CMP.METAL ,VIJAYA, MPS) or other equivalent model as per approved make list attached)								
	Tailor made surgical scrub sink (2 bay) Approximate size 1.4 mX0.54mX0.84m with 1 user elbow operated mixture tap, soap dispensers, drain outlet ,thermostatic control of water temperature	Each	12						
C	MARKET RATE (SOIL, WASTE AND VENT PIPES)-NS								
NS -1	Providing and fixing floor drain & balcony drain made of 100 x 50 mm dia elbow / tee as applicable connected with 50 mm dia CPVC pipe complete including cutting and making good the walls and floor wherever required.	Each	1467						
NS -2	Providing and fixing dash fastner made of rust proof plated steel for holding the soil/waste supply pipes complete in all respect								

Code No	Item Description	Unit	Total Qty.	Supply Only			Installation, Testing & Commissioning		
				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
	Dash fastner for pipe more than 25 mm dia to 150 mm dia pipe of size 25 mm dia and 75 mm long minimum & shall be capable of taking 6 tonnes load and also include the supporting angles 35x35x5 mm/ of required size or MS bars steel structures as per drawing.	Each	16655						
NS-3	Providing and fixing SS Grating (FD+FT) grating 143x143x5 mm thick screwable with SS fixed framed of 150x150 mm size as per approved make and model	Each	4404						
NS -4	Providing and fixing floor clean out plug consist of CI/UPVC bend & GI/UPVC socket heavy class with Brass cap & key for opening male threaded cap etc. including lead caulked to CI/UPVC pipescomplete in all respects as per drawing/ sample approved by Engineer -in -ChargeFCO (floor clean out plug shall be flushed with floor finish 100 mm dia/150/200 mm dia	Each	2045						
NS -5	Providing and fixing G.I/UPVC EXTENSION PIECE for 100 mm dia floor trap formed out of main pipe(Type A) with multiple side inlets, suitable for various dia pipes, side connections, including all fixtures and fittings as per site conditions and as per standard details and water tight sealing of joints and area surrounding the grating and as directed.	Each	4404						
NS-6	Providing and fixing WC connector socket(for vitreous china & UPVC pipe) of EDPM good quality with polypropelene body 100x150/100x250 of approved quality and make complete in all respect.	Each	1046						
NS-7	Providing and fixing 150 mm dia stabiliser pipe/ P.V.C. soil vent/waste pipe and with necessary fixtures and fitting such as bends, tees, single junctions, slopped vent, clamps etc. complete.	Metre	2721						
NS-8	Providing and fixing gun metal non-return valve of approved quality (screwed end) equivalent model as per approved make list attatched) Horizontal 100 mm nominal bore	Each	4						
MARKET RATE WATER SUPPLY (EXTERNAL & INTERNAL)-NS									
NS-1	Providing and fixing pressure reducing valve with strainer delivering desired rate of flow with flanged connection. The complete system is tested to a pressure not less than 15 Kg / Sq.cm and suitable to reduce the pressure upto 1 Kg/Sq.cm) including flanges / unions, nuts, bolts, 1# Pressure gauge complete as required. 15 mm dia 20 mm dia 25 mm dia 32 mm dia 40 mm dia 50 mm dia	Each	5 5 5 20 20 5						
NS-2	Providing and fixing Ball valve (SS) as per specifications of PN 10 rating. 25 mm 32 mm 40 mm 50 mm	Each	126 110 8 5						
NS-3	Providing and fixing Indian make CP brass air valves with gunmetal isolation valve fixed on pipe lines. 15mm n.b air vent with 15mm isolation valve. 20mm n.b air vent with 20mm isolation valve. 40mm n.b air vent with 20mm isolation valve.	Each	83 83 5						
NS-4	Providing and Fixing concealed Bath & Shower Mixer and diverter cutting and making good the wall complete as per instructions of the engineer-in-charge. Code No FLR-CHR-5273UPR from Jaquar or other equivalent model as per approved make list attatched)	Each	5						
NS -5	Providing fixing testing and commissioning of CP brass laboratory cock C.P brass swain makes with delux knob 3 way counter mounted lab sink with C.P. flange, complete as required including necessary wall cutting/chasing and making as required as per direction of engineer in_charge(code no. 1284 Vijaya make or other equivalent model as per approved make list attatched)	Each	10						
NS-6	Providing and fixing closed cell polyolefin tube type thermal insulation over hot water pipes with thermal conductivity not exceeding 0.034 w/mk. At an average temp of 0 degree c , having density of material as 30 kg/m3 , with operating range of -80 degree C to +95 degree C, hcfc- free including all required accessories complete as per manufactur"s specifications for the following pipe sizes and finishing it as per site requirement.(Hot water supply/return pipes) 15 mm dia 20 mm dia 25 mm dia 32 mm dia 40 mm dia 50 mm dia 65 mm dia 80 mm dia	Metre	6024 2107 649 576 643 465 50 10						

Code No	Item Description	Unit	Total Qty.	Supply Only			Installation, Testing & Commissioning		
				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
NS -7	Supplying, fixing, testing and commissioning of storage type water heater (Geyser) etc. with outer body of ABS, 2 MM Thick Mild Steel inner Tank with glass line coating,option of 1/2/3 KW electrically operated single phase 230V, including Glass Lined Double Heating Element,Digital Display, Multifunction Safety Device, ELCB, Anode Rod System, and Brackets for fixing on wall with connecting Wire & plug etc. conforming to IS: 2082 and energy efficient star rated model.								
	15 Litre Capacity	Each	167						
	25 Litre Capacity	Each	712						
	35 litre capacity	Each	4						
NS -8	Providing & fixing water storage cooler of approved make and brand with SS body Complete in respects-230V Single Phase. (Voltas/Shriram/BLUE-STAR or other equivalent model as per approved make list attached)								
	minimum flow rate of 40 ltrs. Per hour and storage capacity 80 ltrs.	Each	89						
NS -9	Providing and fixing approved make & suitable model of R.O. plant 100 ltrs. Per hour flow rate having capacity to treat the raw water having TDS 1200 ppm and not less than 40%. The treated water should have TDS less than 100 ppm and hardness less than 50 ppm. The operating voltage to 230 volt AC +/- 10% alongwith required capacity pump and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, hydro pneumatic tank, over voltage and over current protection with switch mode power supply system antiscaling dosing system complete in all respects including installation and fittings with the following provisions: IONIECHANGE/ KENT/AQUAPROCESS/Pantair or other equivalent model as per approved make list attached)								
	10 micron polypropylene sediment pre filter								
	10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating								
	3 Nos. of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type								
	UV lamp of minimum capacity 100 LPM and minimum lamp wattage 9W	Each	9						
NS-10	Providing and fixing approved make & suitable model of R.O. plant (fully automatic operation) 600ltrs. Per hour flow rate having capacity to treat the raw water and average recovery not less than 35% . The operating voltage to 230 volt AC +/- 10% alongwith required capacity on line SS pump of approved make (3HP minimum) and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, storage tank (3.0 mm (minimum) thick S.S. 304 sheet) 1500 lts of suitable size and ita supporting structure, over voltage and over current protection with switch mode power supply system complete in all respects including installation and fittings with the following provisions: (IONIECHANGE/ KENT/AQUAPROCESS,Pantair or other equivalent model as per approved make list attached.)								
	10 micron polypropylene sediment pre filter								
	10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating								
	Required Nos. and size of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type								
	UV lamp of minimum capacity 600LPH and minimum lamp wattage 15W								
	MS powder coated frame efficient of TDS removal more than 90%. Antiscalant dosing and acid dosing system for self flushing/cleaning.Pressure switches and gauges, pH correction dosing system, Digital TDS meter, Digital pH meter, electric panel and necessary instrumentation included Rotameter.MS structure and fibre glass sheet weather protection cover as per site condition.	Each	18						
NS-11	Providing and fixing approved make & suitable model of R.O. plant (fully automatic operation) 2000 ltrs. Per hour flow rate having capacity to treat the raw water and average recovery not less than 35% . The operating voltage to 230 volt AC +/- 10% along with required capacity on line SS pump of approved make (3HP minimum) and solenoid valves, dry run protection of pump, automatic tank level control, inbuilt auto flush timer for periodic flushing of membranes, storage tank (3.0 mm (minimum) thick S.S. 304 sheet) 1500 lts of suitable size and ita supporting structure, over voltage and over current protection with switch mode power supply system complete in all respects including installation and fittings with the following provisions: (IONIECHANGE/ KENT/AQUAPROCESS,Pantair or other equivalent model as per approved make list attached.								
	10 micron polypropylene sediment pre filter								
	10 micron bacteriostatic activated carbon block on line micron filter with 5 micron rating								
	Required Nos. and size of reverse osmosis memberane with 0.0001 micron pore size energy saving poly amide type								
	UV lamp of minimum capacity 1500LPH and minimum lamp wattage 15W								
	MS powder coated frame efficient of TDS removal more than 90%. Antiscalant dosing and acid dosing system for self flushing/cleaning.Pressure switches and gauges, pH correction dosing system, Digital TDS meter, Digital pH meter, electric panel and necessary instrumentation included Rotameter.MS structure and fibre glass sheet weather protection cover as per site condition.	Each	6						

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
NS-12	Providing and fixing motorized butterfly valve/rotary actuator (CI body, SS316 disc, EPDM boot seat, SS416 shaft, RPTEF bushing @PN16 rating) for filling of water tank complete with electrical water level control panel, including by-pass connection for the same dia with manually operated butterfly valve and all piping and accessories complete in all respects -Valve at Domestic and Flushing OHT Filling								
	40 mm	Each	37						
	50 mm	Each	53						
	65 mm dia	Each	28						
	80 mm dia	Each	4						
	100 mm dia	Each	2						
NS-13	Supply, installation, Testing & Commissioning of PN10 rated Solenoid valves including High / Low switches, and all necessary electric wiring, cabling , control panel including bypass arrange valve								
	40 mm	Each	29						
	50 mm	Each	29						
NS-14	Supply installation, testing & commissioning of cast iron (CI) Butterfly Valves of PN 16 rating								
	65 mm nominal bore	Each	2						
	80 mm nominal bore	Each	4						
	100 mm nominal bore	Each	4						
NS-15	Providing and fixing gun metal foot valve with stainer of approved quality/model complete in all respect								
	50 mm dia	Each	2						
	80 mm dia	Each	2						
	100 mm dia	Each	2						
	150 mm dia	Each	2						
NS-16	Supply, installation, testing and commissioning of heavy duty Pop-up type irrigation sprinkler with working pressure range of 2-6 Bar	Each	200						
NS -17	Providing and fixing of C.I. 'Y' type strainer flanged with SS 304 perforated screen including nuts, bolts and rubber insertions etc								
	80 mm dia	Each	2						
	100 mm dia	Each	2						
	150 mm dia	Each	8						
NS-18	Supplying and installing Bourden type pressure gauges range 0 to 20 bar 10mm brass gauge cock brass pipe snubber etc complete.	Each	16						
NS-19	Providing and fixing puddle flanged including 40 cm long GI pipe piece welded/threaded with MS plates 450x450x6 mm thick with both end screwed/flanged. (For OHT)								
	25 mm dia	Each	2						
	32 mm dia	Each	2						
	40 mm dia	Each	2						
	50 mm dia	Each	2						
	65 mm dia	Each	2						
	For 80 mm dia pipe	Each	4						
	For 100 mm dia pipe	Each	4						
	For 150 mm dia pipe	Each	8						
NS-20	Providing and fixing double seal type D.I. Manhole cover of 560 mm clear internal diameter of over all heavy duty with locking arrangement complete in all respects.	Each	20						
NS-21	Providing and fixing 3 layer PP-R (poly propelyene Random Copolymer) pipes, U V Stabilizer & anti-microbial fusion welding, having thermal stability for hot & cold water supply, including all PP-R plain & brass threaded polypropelyne random fittings including trenching, refilling & testing of joints complete as per direction of engineer in charge.(for.....water supply)								
	25 mm dia (PN10/SDR-11)	Meter	500						
	40 mm dia (PN10/SDR-11)	Meter	300						
	50 mm dia (PN10/SDR-11)	Meter	400						
	65 mm dia (PN10/SDR-11)	Meter	500						
	80 mm dia (PN10/SDR-11)	Meter	700						
	100 mm dia (PN10/SDR-11)	Meter	1900						
	150 mm dia (PN10/SDR-11)	Meter	700						
	SEWARAGE & DRAINAGE (EXTERNAL & INTERNAL)								
	MARKET RATE-SEWARAGE & DRAINAGE (EXTERNAL & INTERNAL)-NS								
NS-1	Providing and laying Non Pressure NP-3 class (Medium duty) R.C.C.pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. Complete								
NS	700 mm dia R.C.C. pipe	Metre	50						
NS	800 mm dia R.C.C. pipe	Metre	50						
NS	1400 mm dia R.C.C. pipe	Metre	10						
NS	1600 mm dia R.C.C. pipe	Metre	10						

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
NS-2	Supply, installation, testing & commissioning of Stainless Steel Perforated Bar Screen having Coarse Screen of 10 mm opening size and fine screen of 3 mm opening size suitable for a peak flowrate of 30 m3/Hr along with suitable lifting arrangement	Set	1						
NS-3	Providing and laying Laboratory/hospital effluent waste pipe and fitting of high density polyethelene (HDPE),CLASS -PE 80 ,pressure rating PN-6,conforming to IS :4427, electric fusion joints/flanged joints , fittings and jointing								
	160 mm dia	Meter	100						
	200 mm dia	Meter	100						
	300 mm dia	Meter	350						
NS-4	Supply of Grease separator of approved model and make HDPE body with sludge trap capacity 5000 Ltrs./hr according to DIN EN 1825, for free standing installation, of polyethylene, material LLD-PE, with grease storage capacity 1000 liters(min.), total wastewater capacity 4000 liters(min.), with direct suction, with connecting flange DN 65 PN 10								
	For local suction line 65/80 mm dia(min.), with fire hose quick coupling with 2 odour proof maintenance openings DN 350 inlet and outlet With approx. dimensions: 2000x2700x1800mm With Inspection Windows & Filling Device. (Make : ACO /Kessel or other equivalent model as per approved make list attached) including 2nos DP /grundfos pump of required capacity (1 working+1 standby), SS motor casing; SS shaft, C.lbody, SS.-impeller,1500rpm with the flow rate of 10-15lps at 12mts head, Solid handling capacity of pump is 12 mm.Electrical Control Panel for Contactor, relay, overload relay , TPMCB for each pump, cyclic timer, TPN for main, R-Y-B Indication, transformer -24-volts;voltmeter, volt selector switch, auto manual switch, 2-push button set, on-trip lights, terminal blocks ;channal and kit complete set; legend plate; powder coated box.								
	With float switch for water level sensing & dry running protection including Grease and sludge Transfer Pump screw type of approved make and model complete in all respect with intermediate sludge PVC storage tank 5000 Ltrs (min.) complete in all respect with pipe and fitting etc. as per instruction of Engineer in charge. The civil cost will be paid under civil work as per approved drawings and detail designs.	Set	3						
B	MARKET RATE SOLAR WATER HEATING SYSTEM								
NS-1	Aluminium cladding over insulated of G.I piping suitable for outdoor applications suitable for following pipe sizes								
	25 dia	Meter	460						
	32 dia	Meter	560						
	40 dia	Meter	400						
	50 dia	Meter	140						
	65 dia	Meter	50						
NS -2	Supply, installation, testing and commissioning of solar water heating system, Thermosyphon type, all complete based on Flat plat collector system (Cu-Cu Type only) comprising of but not limited to the following:								
a)	Requisite number of Flat plate collectors of 2.30 sq. mtr. collector area. Collector absorber plate to be made of copper tubes & copper fins only(Complete cost for sub head above)								
b)	Hot water storage tank made of stainless steel 304- food grade quality minimum 3mm thick with 2 coats of 3M epoxy anti corrosive paint inside the tank with 100 mm Glass wool insulation and cladding with 24 SWG Aluminium sheet. One temperature measuring device and suitable inlet, outlet and drain connections on the storage tank to be provided. Suitable Electrical Heater backup to be provided inside the tank along with thermostat(Complete cost for sub head above)								
c)	Heat Exchanger - plate type external heat exchanger of SS316 plates (make Gea echo flex/Alfalavel/transter) with MS Flanges for transfer of heat minimum 1000 K Calories/collector/hr with necessary pressure guage and temperature guage and isolation valve etc. complete . Suitable make up tank for the Heat Exchanger circuit shall also be provided(Complete cost for sub head above)								
d)	Interconnecting system piping shall consist of B Class insulated GI/CPVC pipes covered with 50mm thick glasswool & clad with 26 SWG Aluminium Sheet. All Gate/Ball valves shall be of ISI make.(Complete cost for sub head above)								
e)	Electrical control panel, cabling from panel to pumps shall also be provided, Electrical panel:16 SWG sheet powder coated electrical panel for outdoor application IP-65, with Digital differential temperature controller for automatic ON/OFF at primary and secondary pumps (3ph) with necessary contractors, relays, control fuse, isolation switches. The cable beyond 100 m if required will be paid seperately in electrical head.(Complete cost for sub head above)								

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
f)	The solar collector shall be arranged on roof of building in such a way that shadow can be avoided and requisite number of MS support for collector/tanks of minimum 40x40x5 MS angle adequate for 150 Km/Hr wind speed.(Complete cost for sub head above)								
h)	Primary Pumps between Collector and Heat Exchanger--Providing of Recirculation Pumps (between Collectors and Heat Exchanger) with SS Impellers and Shaft for Temperature Application upto 90 Deg.C of Required Flow 100 Ltrs./Collector for Minimum Pressure drop of 2 Kg./Cm2 with Isolation Valves, NRVs and Stainer(1W+1S) Pumps.								
g)	Solar water heating system based on Flat plat collector system technology with output capacity of as mentioned below with hot water at 60 degree centigrade having required Nos. solar collectors as per complete item as per technical specification of make BHEL/TATA/EMMVEE/INTER-SOLAR. The system has to be installed by Manufacturers authorised distributors/approved specialised firms of Solar water heating of approved makeThe shop drawing of the systems shall be provided by the agency as per site condition obtain the proper efficiency The system shall be procured after obtaining the approval of shop drawings from HSCC / Engineer-in-charge.(Electric heating element shall not be provided in the system as the solar hot water system will supply the hot water to the individual geyser).								
h)	Supply, Installation, Testing and commissioning of the system complete with necessary Temperature gauge, Temperature sensor, Thermostat with rubber gaskets, Electrical & Control wiring								
i)	Complete Solar System as mentioned above for Capacity 5000 Litre/day (With minimum 38 nos of Collect) of 2.30 Sqm area(Complete cost for sub head above)	Each	12						
NS -3	Supply, installation, testing and commissioning of solar water heating system, Thermosyphon type, all complete based on Flat plat collector system (Cu-Cu Type only) comprising of but not limited to the following:								
a)	Requisite number of Flat plate collectors of 2.30 sq. mtr. collector area. Collector absorber plate to be made of copper tubes & copper fins only								
b)	Hot water storage tank made of stainless steel 304- food grade quality minimum 3mm thick with 2 coats of 3M epoxy anti corrosive paint inside the tank with 100 mm Glass wool insulation and cladding with 24 SWG Aluminum sheet. One temperature measuring device and suitable inlet, outlet and drain connections on the storage tank to be provided. Suitable Electrical Heater backup to be provided inside the tank along with thermostat								
c)	Heat Exchanger - Cage type Internal Heat Exchanger made of SS pipes shall be provided inside the Solar Tank. Heat exchangers shall have min. heat transfer area of 0.24 sq. mtrs. for every 100 LPD capacity.								
d)	Interconnecting system piping shall consist of B Class insulated GI pipes covered with 50mm thick glasswool & clad with 26 SWG Aluminium Sheet. All Gate/Ball valves shall be of ISI make.								
e)	Electrical control panel, cabling from panel to pumps and electrical heaters shall also be provided								
f)	The solar collector shall be arranged on roof of building in such a way that shadow can be avoided and requisite number of MS support for collector/tanks of minimum 40x40x5 MS angle adequate for 150 Km/Hr wind speed.								
g)	Solar water heating system based on Flat plat collector system technology with output capacity of as mentioned below with hot water at 60 degree centigrade having required Nos. solar collectors as per complete item as per technical specification of make BHEL/TATA/EMMVEE/ INTER-SOLAR. The system has to be installed by Manufacturers authorised distributors/approved specialised firms of Solar water heating of approved makeThe shop drawing of the systems shall be provided by the agency as per site condition obtain the proper efficiency The system shall be procured after obtaining the approval of shop drawings from HSCC / Engineer-in-charge.(Electric heating element shall not be provided in the system as the solar hot water system will supply the hot water to the individual geyser).								
h)	Supply, Installation, Testing and commissioning of the system complete with necessary Temperature gauge, Temperature sensor, Thermostat with rubber gaskets, Electrical & Control wiring								
a	Complete Solar System as mentioned above for Capacity 1500 Litre/day (With minimum 12 nos of Collect) of 2.30 Sqm area(Complete cost for sub head above)	Each	8						
b	Complete Solar System as mentioned above for Capacity 1000 Litre/day (With minimum 08 nos of Collect) (Complete cost for sub head above)	Each	12						

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1	2	3	4	5	6	7	8	9	10
	Providing and Fixing of heat pump air Source IRG-1S Heat Pump of 39 KW output capacity having COP of 4.6 in normal working conditions to heat atleast 900 ltrs of water per hour upto 55 deg C with necessary stands, supports parts etc. including internal piping of G.I/CPVC of size class C of 25-50mm dia with nitrile insulation and Aluminium foil alongwith supply of 2 nos. Grundfos/Wilo/Leo make pump (1W+1S) to circulate the water between heat pump and hot water storage tanks with necessary M.S Support, ball valve, stainer etc. Also includes the cost of Control Panel made out of 24 SWG CRC sheet with necessary MCB, Contractor, Relay and ON/Off switch to control the heat pump automatically operational complete in all respect.	Nos.	4						
	RAIN WATER PIPING-								
	BOREWELL-								
	MARKET RATE- BOREWELL-(NS ITEM)								
A	Submersible pumps								
NS	Providing and installing submersible pump and electrical panel suitable for 200 mm dia casing of bore with SS impeller, high tensile SS shaft, copper wound squirrel cage wet type induction motor 2880 rpm, 415 V, 50 Hz, 3 phase A.C. supply, conforming to ISS: 8034-1976, capacity 300-500 LPM at 80-120 m head along with a directly coupled submersible type squirrel cage electric induction 10 H.P.(minimum). motor suitable for operation on 400 V, 3 phase, 50 c.p.s. A.C. supply, water lubricated bearings and provided with pivoted segment type thrust bearings to withstand non-vertical lead with minimum wear and tear and duly fitted with device to take up the expansion of water with heating of motor, including supply, testing and commissioning of electrical panel from the same manufacturer, complete with all accessories in all respects. The contractor to obtain approval for model and make of pump set & suitable Electrical panel after having yield report of fully developed tube well and submit actual bore strata chart.								
A)	including supplying laying and fixing water proof PVC insulated flat submersible cable 3x10 sqmm with end termination with its accessories. complete in all respect as required. 1 No. 3 Phase, fully automatic star-delta starter, type - II of 15 HP with thermal overload relay, contactor, Timer, Push Buttons and Auto-manual selector switch etc complete as required.	SET	6						
NS	Carrying out Electrical logging of Borewell before lowering of pipe for analyzing of water quality including Electrical logging report, calculation etc. including carry out hydrological survey report before boring & getting the approval based on Hydrogeological survey before start of the work. Also getting approval from local authority if any required	Job	6						
	SUBTOTAL (BOREWELL)								
B	MARKET RATE RAIN WATER HARVESTING-(NS ITEM)								
NS-1	Constructing settling tank with SS bar screen of 10 mm opening size, of sizes 4500x2500 with suitable depth up to 2.0 m in 1: 4 Cement Mortar (one cement : 4 coarse sand) height as per site requirement, in brick masonry 350mm thick walls upto water level and 230mm thick walls above water level & upto ground level, including all excavation, 20 cm thick bed concrete in 1:4:8 (one cement 4 fine sand & stone aggregate 40 mm), cement plaster 1:3 (one cement :3 coarse sand) with a floating coat of neat cement as inside finish , top slab in RCC 1:2:4, including centering, shuttering and steel work, also providing and fixing D.I. manhole cover & frame of size 605mm x 450mm of weight not less than 38 kg (frame + cover) and cost of 100mm dia C.I. vent pipe with C.I. Ventilating Cowl and suitable wire mesh provision for inlet, 115mm baffle walls extending 2/3 the width spaced@500mm c/c including finishing with 1:3 cement plaster 15mm thick with floating coat of neat cement slurry , all complete in every respect as pechart. ng and as directed to suit site condition.	Each	36						
NS-2	Designing and Constructing of percolation pit cum perforated well 3000mm. dia upto 4000mm deep, 230 mm thick brick masonry work around upto 1.5 m deep with 75 class brick in cement mortar 1:4, 200 mm foundation concrete in 1:4:8 mix below brick work only, 150 mm thick precast removable RCC top slab with required steel reinforcement in cement concrete 1:2:4 mix, filled with coarse aggregate, SFRC covers, river pebbles of requisite size stone as shown in the drawing including centering and shuttering, as shown complete as per detailed drawings complete.	Each	36						
	WTP & PUMP ROOM WORKS								
A	WTP (for other than flushing - water demand)-For Hospital & Academic Building								
	Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use of domestic purpose comprising of filter and pumps. The plant is to be installed in pump room and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc.								
	The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make.(Ion exchange, oxybee solutions, Pollucon technologies, Thermax, Geo miler, Enzotech).								

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1	2	3	4	5	6	7	8	9	10
a)	Providing and fixing vertical in line raw water filter feed pumps with CI volute and SS impeller and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts, 2900 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer (Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency) Raw water filter feed pumps(only for domestic use). Capacity : 500 lpm (Each) Head : 35 m Power : 50 HP(minimum) with 100% standby pumps (Complete cost for sub head above)(Complete cost for sub head above)	each	4						
b)	Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen, flanged ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent) 50/80 mm dia (min.) or required size and required number(1 Set)(Complete cost for sub head above)(Complete cost for sub head above)	set	2						
c)	Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm ² , screwed end connections complete . (Make: Leader/ Zoloto or equivalent)(Complete cost for sub head above) 80/50 mm NB (min.) or required size and number(1 Set)(Complete cost for sub head above)	set	2						
d)	Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.(Complete cost for sub head above) 80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery) (Complete cost for sub head above)	set	2						
e).	Filtration Plant : Vertical Down flow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :(Complete cost for sub head above) a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes. b) Initial charge of Filter Media. c) Complete underdrain system and raw water distributor as per manufacturer's design. d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size. e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet. f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint . g) The filter shall be complete with all gaskets / fasteners of standard quality as required. h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The filter water will be supplied to treated water tank through activated carbon filter, Softener & UV water steriliser. Capacity - 500 lpm Filtration rate - 20,000 lph/sqm (min.) Filter dia approx. 1.20 m (min.) Filter HOS Min. : 1600 mm (min.) Working pressure : 3.0 Kg/sq cm. Test pressure : 4.5 Kg/sq cm(Complete cost for sub head above)(Complete cost for sub head above)	set	2						
f)	Filtration Plant : Activated Carbon Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have : a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes. b) Initial charge of Activated Carbon c) Complete underdrain system and raw water distributor as per manufacturer's design. d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size. e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								

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1	2	3	4	5	6	7	8	9	10
	f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint .								
	g) The filter shall be complete with all gaskets / fasteners of standard quality as required.								
	h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The water shall be received from pressure sand filter and supplied to softener & through UV steriliser before being sent to treated water tank. Capacity - 500 lpm Filtration rate - 20,000 lph/sqm (min.) Filter dia approx. 1.20 m (min.) Filter HOS Min. : 1600 mm (min.) Working pressure : 3.0 Kg/sq cm. Test pressure : 4.5 Kg/sq cm								
	complete activated carbon filter(Complete cost for sub head above)(Complete cost for sub head above)	set	2						
	g) UV WATER STERILISERS(between filter &clear water tank)								
	High performance on line UV water sterilizers of capacity 650 lpm designed on at least 250 J/Sq. M. UV dosage, comprising of glass UV chamber in SS 316 housing, UV lamp and electrical circuit, wall mounted model / line mounted model, capacity 650 lpm, minimum lamp rating :150 watts - 1 Nos. Min. UV intensity > 60000(Complete cost for sub head above)	set	2						
	h) Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 (Heavy class) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers.								
	50 mm dia (min.) (Interconnection between units)/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)(Complete cost for sub head above)(Complete cost for sub head above)	set	2						
	i) Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).(Complete cost for sub head above)	SET	2						
	Providing and fixing of Oxilyte (Mixed Oxidant) Generation System , based on ECA technology, producing non toxic mixed oxidant solution 50 Ltrs/hr at 1000 ppm of Oxidant concentration with auto flushing system . The solution should be at a pH 3+-0.5 suitable for 24x7 operations should produce 1000 L per day. The system should be supplied complete with appropriate dosing pumps, valves, piping, fittings, chemical dosing tank etc. complete in all respect((shope drawing model and technical data etc. are to be submitted for approval before purchase). The system shall install to dose the oxylite solution in the treated water transfer pumping main and synchronised with the operation of transfer pump(Complete cost for sub head above)	SET	2						
	Supply, fabrication, erection, painting of pipe supports of structural steel, for piping work in the production areas and anchoring them. 2 coats of zinc chromate primer and one coat of finishing paint (Complete cost for sub head above)	Kgs.	3000						
	Supplying, assembly, erection, testing and commissioning of level controllers based on level switches and necessary auxiliary circuits included in the electric panel ,including all accessories required for the performance of the system to the satisfaction of the engineer in charge complete including providing and fixing wiring from control panel to the level switches of required size, all interconnections as required . Note : The required transformers / associated equipment shall be designed keeping in view the actual distance of various tanks from the control panel, particularly the distance of Terrace water tank from panel. The most suitable route of sensor cable travel between the panel and the tank shall have to be worked out by the contractor according to site conditions and in consultation with engineer in charge. All cabling / switch installation should be done in an easy to maintain manner.								
	One way one tank level controller as under.(Complete cost for sub head above)	SET							
	To switch on the tube well pump when the level of water in the UG raw water tank is low and to cut off the pump when the level in the underground raw water tank is high. (Approx. control cable requirement -200 meters.)								
	Two way - Two tank level controller as under.(Complete cost for sub head above)	SET	1						
	For Filter Feed Pumps for Domestic Water.(Operating between the raw water tank and the under ground treated water tank near the plant room. (Approx. control cable requirement - 100 meters.) (Complete cost for sub head above)	SET	1						
	For Treated water supply Pumps(Operating between the under ground treated water tank near the plant room and the Terrace treated water tank . (Approx. control cable requirement - 150 meters.) (Complete cost for sub head above)	SET	1	PHE BOQ (final)					

Code No	Item Description	Unit	Total Qty.	Supply Only			Installation, Testing & Commissioning		
				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
	Supplying, installing, testing and commissioning vertical on line multi stage centrifugal pumping set with mechanical seal, C.I. volute and SS impeller & SS shaft connected to a TEFC induction motor of suitable HP for 415 volts, 3 phase, 50 cycles A.C. supply with 150 mm dia pressure gauge with SS/gunmetal isolation cock, vibration eliminating pads, base plate wiring upto panel and equipment for water level controller to start and stop the pump automatically at predecided levels of the water in the tank with provision of protection for dry run etc. complete in all respect. The efficiency of the pump shall be more than 60% (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).								
a)	Flushing Pump in Main UGT to connect to flushing ring line (hospital) Capacity : 350 lpm (Each) Head 70 m Power : 5 HP(minimum) with 100% standby pumps complete pump set as above (Complete cost for sub head above)(Complete cost for sub head above)	Each	4						
b)	Treated water transfer pump from UGT to terrace tank (for Hospital & Academic) capacity: 500LPM & 70m head (Complete cost for sub head above)(Complete cost for sub head above)	Each	4						
c)	Treated water transfer pump from UG tank to terrace tank for Res. Building Capacity- 350 LPM & 70 M head each	Each	4						
d)	Raw water transfer pump to terrace tank (Resid. Block) Capacity- 350 LPM & 70 M head each	Each	4						
	Supply, installing, testing and commissioning vertical fully floodable type Submersible drainage pump of non-corrosive material in close coupled design single stage, suitable for handling minimum 10 mm dia solids for transferring waste water from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump, start and stop push button contactor with required overload production and single phase preventer.								
	Material of Construction (M.O.C): Corrosion Resistant in general : Casing — Cast Iron : Impeller — SS : Bearings — Anti friction, prelubricated ball bearings, packed with grease for life.								
	Motor: — Dry Motor with built in over load protection Protection - IP68. Insulation Class - F Duty of each pump								
	350 LPM against 15 M head - For Pump Room Drainage & Basement								
a)	Complete as mentioned above including testing, training and trial run till commissioning of pump, system. (Complete cost for sub head above) Softner For HVAC	set	4						
	Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use for domestic purpose comprising of filter and pumps. The plant is to be installed in pump room at basement level and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc.								
	The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, AKAR Impex,Thermax, Aquaprocess, Oxybee, Enzotech).								
	Providing and fixing horizontal/ vertical on line single/multi-stage raw water filter feed pumps mounting on a foundation with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts, 1500 RPM,3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts etc. with suction stainer (Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency)								
	Water Softener feed pump Capacity : 500 LPM Head 35 m Power : 5 HP (minimum)								
a)	for softener system) (Complete cost for sub head above)	each	4						

Code No	Item Description	Unit	Total Qty.	Supply Only			Installation, Testing & Commissioning		
				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
b)	Providing and fixing GI/CPVC epoxy coated pipe & fittings and specials for suction and discharge side of pumps as required to connect Suction strainers and isolation butterfly valves on suction side and isolation valves and NRVs on discharge side, and to make a common discharge header from all pumps. Individual pump suction and discharge size minimum : 80 mm x 65 mm. The pumps shall have 100 mm NB butterfly valves and 100 mm NB flanged Y type strainers on suction side and common discharge header size : 80 mm NB including required numbers of matching flange, bolts, nuts, rubber gaskets, all complete as required / as per drawings or specifications. (complete lot) (Complete cost for sub head above)	set	2						
c)	Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen, flanged ends in installed outside water tanks. (Make: Leader / Zoloto / Castle or equivalent) (Complete cost for sub head above)								
	80/100 mm dia (4 nos.) (min.) or required size and required number	set	2						
d)	Providing and fixing G / M or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm ² , screwed end connections complete. (Make: Leader/ Zoloto/Castle or equivalent)								
	80/65 mm NB (min.) or required size and number (Complete cost for sub head above)	set	2						
e)	Filtration Plant : Vertical Downflow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have : (Complete cost for sub head above)								
	a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.								
	b) Initial charge of Filter Media.								
	c) Complete underdrain system and raw water distributor as per manufacturer's design.								
	d) M.S. heavy class fabricated - epoxy coated / post galvanised face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.								
	e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								
	f) All internal parts of the filtration plant shall be coated 6 mm thick natural rubber lining after thorough sand blasting. All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint.								
	g) The filter shall be complete with all gaskets / fasteners of standard quality as required.								
	h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, Geomiller, Thermax, Aquaprocess, LN Tech). The filter water will be supplied to Softner before collecting in treated water tank.								
	Capacity - 5000LPM								
	Filtration rate - 20,000 lph/sqm (min.)								
	Filter dia approx. 1200 mm (min.)								
	Filter HOS Min. : 1600 mm (min.)								
	Working pressure : 3.0 Kg/sq cm.								
	Test pressure : 4.5 Kg/sq cm (Complete filter for Softener system (Complete cost for sub head above)	each	2						
f)	Providing and fixing, testing and commissioning M.S. Vertical Upflow "Cation" Ion Exchange water Softener fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8mm thick M.S. plate on dished ends as per applicable IS standards. The vessel shall be internally lined with 6.00 mm thick rubber, tested to 60 - 80 shore hardness, 15000 RMS volts spark test for continuity. The softener shall have :								
	a) Strainer plates at top and bottom with P.P. strainers with removable nuts and check nuts fixed on the plates.								
	b) GI/CPVC heavy class fabricated internally rubber lined face piping comprising of connections with CI Diaphragm Valves of required size for inlet, outlet, and rinse drain etc.								
	c) Regeneration assembly comprising of power valve, ejector, brine suction valve, and all necessary piping incorporated into the main pipework.								
	d) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								
	e) All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint.								
	f) The softener shall be complete with all gaskets / fasteners of standard quality as required.								
	g) Initial charge of Ion Exchange resin.								
	h) The softener shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein.								

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
	i) M.S. rubber lined vertical, cylindrical self supporting open tank for salt mixing and brine saturation with air agitation arrangement comprising of G. I. heavy class air distributor laid at the bottom of tank, roots type air blower complete in all respects of suitable capacity to agitate the required quantity of brine, piping interconnection between air blower and air distributor. The brine tank to have nozzles for outlet, overflow and drain. Outside finished with high gloss enamel paint over two coats of zinc chromate primer complete including testing and commissioning. Net usable capacity of the tank excluding free board etc., should be at least 10 % more than actual capacity required.								
	Capacity of softening plant : 500 LPM								
	Raw Hardness : 700-1200 mg/l.								
	Regeneration period interval not less than 8 hr.								
	Quantity of soft water between two regenerations =150KL								
	Approximate Dia =1200 mm, HOS 1600 mm (min.) or as required								
	Type of Resin : Strongly acidic cation resin								
	Make of Resin : Ion Exchange / Rohm & Haas								
	Min. qty. of resin :1600 Ltrs.								
	Operating pressure : 3.0 kg/sqcm								
	Test pressure : 5.50 kg/sqcm (Set-1)								
	Soft water quality: Commercial zero hardness(Complete softner system)	Set	1						
	Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 (Heavy class) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers. (Complete cost for sub head above)	Set	1						
	g) 65/80 mm dia (min.) (Interconnection between units)/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item) (Complete cost for sub head above)	Set	1						
	h) Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).80 mm dia (min.) (as per required length) (Complete cost for sub head above)	Set	1						
	i) For Residential Buildings								
	Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use of domestic purpose comprising of filter and pumps. The plant is to be installed in pump room and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc.								
	The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make.(Ion exchange, oxybee solutions, Pollucon technologies, Thermax, geo miler, enzotech).								
	a) Providing and fixing vertical in line raw water filter feed pumps with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,2900 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer (Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency)								
	Raw water filter feed pumps(only for domestic use).								
	Capacity : 350 lpm (Each)								
	Head 3 m								
	Power : 3.0 HP(minimum)								
	with 100% standby pumps(Complete cost for sub head above)	each	4						
	b) Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent)								
	50/80 mm dia (min.) or required size and required number(1 Set)(Complete cost for sub head above)	set	2						
	c) Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto or equivalent)								
	80/50 mm NB (min.) or required size and number(1 Set)(Complete cost for sub head above)	set	2						
	d) Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.								
	80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery)(Complete cost for sub head above)	set	2						
	e). Filtration Plant : Vertical Down flow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :								

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1	2	3	4	5	6	7	8	9	10
	a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.								
	b) Initial charge of Filter Media.								
	c) Complete underdrain system and raw water distributor as per manufacturer's design.								
	d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.								
	e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								
	f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint .								
	g) The filter shall be complete with all gaskets / fasteners of standard quality as required.								
	h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The filter water will be supplied to treated water tank through activated carbon filter, Softener & UV water steriliser. Capacity - 350 lpm Filtration rate - 20,000 lph/sqm (min.) Filter dia approx. 0.80 m (min.) Filter HOS Min. : 1500 mm (min.) Working pressure : 3.0 Kg/sq cm. Test pressure : 4.5 Kg/sq cm								
f)	Filtration Plant : Activated Carbon Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have : a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes. b) Initial charge of Activated Carbon c) Complete underdrain system and raw water distributor as per manufacturer's design. d) M.S. heavy class fabricated - epoxy coated / post galvanized face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size. e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet. f) All internal parts of the filtration plant shall be coated with two coats of food grade epoxy paint after thorough sand blasting. All external surfaces of the plant including piping shall be coated with two coats of red iron oxide / zinc chromate primer followed by two coats of high gloss enamel paint . g) The filter shall be complete with all gaskets / fasteners of standard quality as required. h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make. The water shall be received from pressure sand filter and supplied to softener & through UV steriliser before being sent to treated water tank. Capacity - 350 lpm Filtration rate - 20,000 lph/sqm (min.) Filter dia approx. 0.80 m (min.) Filter HOS Min. : 1500 mm (min.) Working pressure : 3.0 Kg/sq cm. Test pressure : 4.5 Kg/sq cm complete activated carbon filter(Complete cost for sub head above)	set	2						
h)	UV WATER STERILISERS(between filter &clear water tank) High performance on line UV water sterilizers of capacity 400 lpm designed on at least 250 J/Sq. M. UV dosage, comprising of glass UV chamber in SS 316 housing, UV lamp and electrical circuit, wall mounted model / line mounted model, capacity 650 lpm, minimum lamp rating :150 watts - 1 Nos. Min. UV intensity > 60000(Complete cost for sub head above)	set	2						
i)	Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 (Heavy class) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers. 50 mm dia (min.) (Interconnection between units)/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)(Complete cost for sub head above)	set	2						

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
j)	Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).(Complete cost for sub head above)	SET	2						
	Providing and fixing of OxiLyte (Mixed Oxidant) Generation System , based on ECA technology, producing non toxic mixed oxidant solution 50 Ltrs/hr at 1000 ppm of Oxidant concentration with auto flushing system . The solution should be at a pH 3+-0.5 suitable for 24x7 operations should produce 1000 L per day. The system should be supplied complete with appropriate dosing pumps, valves, piping, fittings, chemical dosing tank etc. complete in all respect((shope drawing model and technical data etc. are to be submitted for approval before purchase). The system shall install to dose the oxylite solution in the treated water transfer pumping main and synchronised with the operation of transfer pump	SET	2						
	Supply, fabrication, erection, painting of pipe supports of structural steel, for piping work in the production areas and anchoring them. 2 coats of zinc chromate primer and one coat of finishing paint	Kgs.	3000						
	Supplying, assembly, erection, testing and commissioning of level controllers based on level switches and necessary auxiliary circuits included in the electric panel ,including all accessories required for the performance of the system to the satisfaction of the engineer in charge complete including providing and fixing wiring from control panel to the level switches of required size, all interconnections as required . Note : The required transformers / associated equipment shall be designed keeping in view the actual distance of various tanks from the control panel, particularly the distance of Terrace water tank from panel. The most suitable route of sensor cable travel between the panel and the tank shall have to be worked out by the contractor according to site conditions and in consultation with engineer in charge. All cabling / switch installation should be done in an easy to maintain manner.								
a)	One way one tank level controller as under.	SET							
	To switch on the tube well pump when the level of water in the UG raw water tank is low and to cut off the pump when the level in the underground raw water tank is high. (Approx. control cable requirement -200 meters.) (Complete cost for sub head above)								
b)	Two way - Two tank level controller as under.	SET	1						
	For Filter Feed Pumps for Domestic Water.(Operating between the raw water tank and the under ground treated water tank near the plant room. (Approx. control cable requirement - 100 meters.) (Complete cost for sub head above)	SET	1						
c)	For Treated water supply Pumps(Operating between the under ground treated water tank near the plant room and the Terrace treated water tank . (Approx. control cable requirement - 150 meters.) (Complete cost for sub head above)	SET	1						
	Supplying, installing, testing and commissioning vertical on line multi stage centrifugal pumping set with mechanical seal, C.I. volute and SS impeller & SS shaft connected to a TEFC induction motor of suitable HP for 415 volts, 3 phase, 50 cycles A.C. supply with 150 mm dia pressure gauge with SS/gunmetal isolation cock, vibration eliminating pads, base plate wiring upto panel and equipment for water level controller to start and stop the pump automatically at predecided levels of the water in the tank with provision of protection for dry run etc. complete in all respect. The efficiency of the pump shall be more than 60% (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).								
a)	Flushing Pump in Main UGT to connect to flushing ring line Capacity : 350 lpm (Each) Head : 70 m Power : 12 HP(minimum) with 100% standby pumps complete pump set as above(Complete cost for sub head above)	each	2						
c)	Treated water transfer pump from UGT to terrace tank (for residential building) capacity: 350LPM & 70m head(Complete cost for sub head above)	each	4						
d)	Raw water transfer pump to terrace tank (residential block) capacity: 350LPM & 70m head(Complete cost for sub head above)	each	2						
	Supply, installing, testing and commissioning vertical fully floodable type Submersible drainage pump of non-corrosive material in close coupled design single stage, suitable for handling minimum 10 mm dia solids for transferring waste water from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump, start and stop push button contactor with required overload protection and single phase preventer.								
	Material of Construction (M.O.C): Corrosion Resistant in general : Casing — Cast Iron : Impeller — SS : Bearings — Anti friction, prelubricated ball bearings, packed with grease for life.								
	Motor: — Dry Motor with built in over load protection Protection - IP68.								

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				Supply Rates (without GST)	Supply Amount (without GST)	GST for supply (%)	Installation, Testing & Commissioning Rates (Without GST)	Installation, Testing & Commissioning Amount (Without GST)	GST For I/T/C (%)
1	2	3	4	5	6	7	8	9	10
	Insulation Class - F								
	Duty of each pump								
	350 LPM against 15 M head - For Pump Room Drainage & Basement								
a)	Complete as mentioned above including testing, training and trial run till commissioning of pump, system.(Complete cost for sub head above)	set	2						
	Softner For HVAC								
	Planning, Designing, Detailing, Manufacturing, Supplying, Erection, Testing and Commissioning of Water treatment plant for supply of treated water for use for domestic purpose comprising of filter and pumps. The plant is to be installed in pump room at basement level and Raw water supply is available in UGT including design and execution of all Civil, Structural, Electrical, Mechanical, Plumbing and processing, ancillary equipments & works etc required to complete the package, getting approval from HSCC/client etc.								
	The shop drawings & design of WTP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, AKAR Impex,Thermax, Aquaprocess, Oxybee, enzotech).								
a)	Providing and fixing horizontal/ vertical on line single/multi-stage raw water filter feed pumps mounting on a foundation with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts, 1500 RPM,3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts etc. with suction stainer (Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency)								
	Water Softener feed pump								
	Capacity : 500 LPM								
	Head 35 m								
	Power : 5 HP (minimum)								
	with 100% standby pumps(1W+1S)(The one set of the system will comprise the cost of 2 nos. pumps for softener system)(Complete cost for sub head above)	each	4						
b)	Providing and fixing GI/CPVC epoxy coated pipe & fittings and specials for suction and discharge side of pumps as required to connect Suction strainers and isolation butterfly valves on suction side and isolation valves and NRVs on discharge size , and to make a common discharge header from all pumps. Individual pump suction and discharge size minimum : 80 mm x 65 mm. The pumps shall have 100 mm NB butterfly valves and 100 mm NB flanged Y type strainers on suction side and common discharge header size : 80 mm NB including required numbers of matching flange, bolts, nuts, rubber gaskets, all complete as required / as per drawings or specifications. (complete lot)(Complete cost for sub head above)	set	2						
c)	Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Castle or equivalent)								
	80/100 mm dia (4 nos.) (min.) or required size and required number(Complete cost for sub head above)	set	2						
d)	Providing and fixing G / M or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto/Castle or equivalent)								
	80/65 mm NB (min.) or required size and number	set	2						
e)	Filtration Plant : Vertical Downflow Multigrade Pressure Sand Filter in MS Welded construction fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8 mm thick M.S. plate on dished ends as per applicable IS standards. The filter shall have :								
	a) One no pressure tight manhole and at least one no. pressure tight side hole for maintenance purposes.								
	b) Initial charge of Filter Media.								
	c) Complete underdrain system and raw water distributor as per manufacturer's design.								
	d) M.S. heavy class fabricated - epoxy coated / post galvanised face piping comprising of connections with CI Butterfly Valves of required size for inlet, outlet, backwash inlet, backwash drain and rinse drain. Air release line with GM Ball Valve of required size.								
	e) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								
	f) All internal parts of the filtration plant shall be coated 6 mm thick natural rubber lining after thorough sand blasting. All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint .								
	g) The filter shall be complete with all gaskets / fasteners of standard quality as required.								
	h) The filter shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein. The work has to be carried through authorised vendor, dealer/representative of approved make (Ion exchange, Pollucon technologies, Geomiller, Thermax, Aquaprocess, LN Tech). The filter water will be supplied to Softner before collecting in treated water tank.								

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1	2	3	4	5	6	7	8	9	10
	Capacity - 5000LPM								
	Filtration rate - 20,000 lph/sqm (min.)								
	Filter dia approx. 1200 mm (min.)								
	Filter HOS Min. : 1500 mm (min.)								
	Working pressure : 3.0 Kg/sq cm.								
	Test pressure : 4.5 Kg/sq cm (Complete filter for Softener system(Complete cost for sub head above)	each	2						
f)	Providing and fixing, testing and commissioning M.S. Vertical Upflow "Cation" Ion Exchange water Softener fabricated in accordance with IS 2825 from minimum 6 mm thick M.S. plate on shell and minimum 8mm thick M.S. plate on dished ends as per applicable IS standards. The vessel shall be internally lined with 6.00 mm thick rubber, tested to 60 - 80 shore hardness, 15000 RMS volts spark test for continuity. The softener shall have :								
	a) Strainer plates at top and bottom with P.P. strainers with removable nuts and check nuts fixed on the plates.								
	b) GI/CPVC heavy class fabricated internally rubber lined face piping comprising of connections with CI Diaphragm Valves of required size for inlet, outlet, and rinse drain etc.								
	c) Regeneration assembly comprising of power valve, ejector, brine suction valve, and all necessary piping incorporated into the main pipework.								
	d) Pressure gauges (100 mm dia bourdon type pressure gauge) / Sampling points with SS isolation cocks at inlet and outlet.								
	e) All external surfaces of the plant including piping shall be coated with epoxy primer followed by two coats of high gloss epoxy paint .								
	f) The softener shall be complete with all gaskets / fasteners of standard quality as required.								
	g) Initial charge of Ion Exchange resin.								
	h) The softener shall be designed to give rated output at given raw water quality and flow rate without any operational problem and should not get any loss of performance as long as the operating pressure remains within the given range. Any additional provision is required to make the item complete, the same should be included herein.								
	i) M.S. rubber lined vertical, cylindrical self supporting open tank for salt mixing and brine saturation with air agitation arrangement comprising of G. I. heavy class air distributor laid at the bottom of tank, roots type air blower complete in all respects of suitable capacity to agitate the required quantity of brine, piping interconnection between air blower and air distributor. The brine tank to have nozzles for outlet, overflow and drain. Outside finished with high gloss enamel paint over two coats of zinc chromate primer complete including testing and commissioning. Net usable capacity of the tank excluding free board etc., should be at least 10 % more than actual capacity required.								
	Capacity of softening plant : 1000 LPM								
	Raw Hardness : 700-1200 mg/l.								
	Regeneration period interval not less than 8 hr.								
	Quantity of soft water between two regenerations =250KL								
	Approximate Dia =1800 mm, HOS 2000 mm (min.) or as required								
	Type of Resin : Strongly acidic cation resin								
	Make of Resin : Ion Exchange / Rohm & Haas								
	Min. qty. of resin :2100 Ltrs.								
	Operating pressure : 3.0 kg/sqcm								
	Test pressure : 5.50 kg/sqcm (Set-1)(Complete cost for sub head above)	set	1						
	Soft water quality: Commercial zero hardness								
g)	Providing and fixing G.I.pipes/CPVC pipes to I.S. 3589/1239 (Heavy class) with G.I./CPVC Fittings e.g., Tee, elbow reducers, unions, end cap etc., flanges & clamps, including supporting the pipes with G.I. supports, cutting and making good the walls etc. complete. For Suction & Delivery headers.(Complete cost for sub head above)	set	1						
h)	65/80 mm dia (min.) (Interconnection between units)/ Drain lines etc. as per plant room requirement. (All piping and fitting of required size inside the plant room included in the item)(Complete cost for sub head above)	set	1						
i)	Painting G.I./CPVC pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved priming coat as directed by the Project-in-charge (shade as per pipe colour code).								
	80 mm dia (min.) (as per required length)(Complete cost for sub head above)(Complete cost for sub head above)	set	1						
	SUB TOTAL(WTP & PUMP ROOM WORKS)-NS ITEM								
	EFFLUENT TREATMENT PLANT(ETP) -								
	Providing and fixing packaged type Effluent treatment plant including design/shop drawing and obtain the approval from HSCC,erection,commissioning,construction of ETP including civil,mechanical,electrical,piping work complete in all respect on turnkey basis.The system should be fully automatic with level control,compact,odor free and shall consume low power. ETP will be placed near STP site of the building of suitable size for 100 KLD required to treat the effluent of lab,laundry,kitchen and hospital facilities by using suitable technology complete in all respect including oil and grease trap/chemical reaction with suitable chemical dosing such as Fentons reagent or any other suitable for effluent/mixer/settler/neutralisation chamber,dosing pump and agitator ,holding tank,including multigrade filter stand by motor pump,blower etc. pumps and piping,filter,sludge holding tank,filter press,testing kit,electrical panel,air blower,RCC Equilisation tank/holding tank.Treated water transfer pump and sump of suitable capacity								

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1	2	3	4	5	6	7	8	9	10
	.Agency has to monitor the lab waste effluent for various parameter and quantity obtaining desired no. of test reports of raw/treated lab effluent The ETP work includes pumps,blower,raw and treated water tank PVC,electric Panel, electric wire inside the ETP area, 1 No. mixed oxident generation system based on ECA Technology of approved make 30 Ltrs/hr capacity. SS Agetor in SS-316 reactor Tanks(2-3 mm thick), Dosing pumps & tanks , ladder,working platform,painting,interconnecting pipe valve,foundation, support etc., complete in all respect(all pump shall be SS impler & adequate solid handling capacity, Mechanical Seal).								
	All the unit of ETP shall be MS sheet min. 4/5 mm thickness or FRP Sheet mini. 8 mm thick with suitable structure support complete in all respect including min2-.3 layers approved epoxy / FRP or other approved corrosion resistant coating/protection of all parts.The ETP units shall be designed in such a way that the lab effluent doesnot effect the function of STP when treated lab effluent mixed in the domestic sewer line,treated effluent shall meet the SPCB norms and also obtain adequacy report and treated effluent test report for SPCB. Agency has to maintain and operate the ETP during defect liability period including cost of manpower,chemical etc except electricity cost.Work shall be carried out by specialised agency / authorized Vender of ETP (Geo Miler & Co, Ion-Exchange, Oxybee, Pollucon Technologies,Thermax,Enzotech) authorized Vender will be required to produce documents in support of their authorization from the specialised agency. The work shall be carried out by trained authored staff of the chart. ng and as directed to suit site c	Job	1						
Subtotal (Effluent Treatment Plant)									
SEWAGE TREATMENT PLANT									
	Planning,Designing,Detailing,Supplying, Erection,Testing and Commissioning of Sewage treatment plant based on MBBR (Moving bed Bio Reactor)/FAB technology of average flow rate of 700 cu.m/day (To be planned in 2 streams of 350 kld each) for sewer including provision of recirculation of treated sewage/effluent for the use of horticulture/flushing/A/c purposes including design and execution of all civil,structural,electrical,mechanical, plumbing and processing, ancillary equipments and works etc required to complete the package, getting approval from state pollution control board and other statutory bodies as well as from consultant (consultant) /Client including the cost of STP building for electrical room, treated sewage under ground storage tank etc.								
	All the water retaining structure shall be designed as water retaining structure as per provision of IS code and water proofing with fixed or any other approved chemical shall be carried out by approved agency with 10 year (minimum) guaranty. All the unit shall be painted by epoxy or fixed with the white glazed tiles of approved make. The civil works of entire STP will be carried out by agency as per drawings prepared by STP E&M agency. The shop drawings & design of STP shall also be prepared in such a way that it comprise of the following units of required size as per detail design requirements & meeting the following requirements The work has to be carried by approved make agency / through authorised vendor/dealer of approved make under overall supervision of main approved agency as per list of approve make (Ion exchange, Pollucon technologies, Thermax, geo miler, oxybee, enzotech).								
A	The shop drawings & design of STP shall be prepared by the agency . As per site condition/available space most of the unit will be placed below/ground under road/green area/ as per site condition and equipment and Panel room may be above the ground level as per approved drawings .The STP shall be comprising of the following units of required size as per detail process and hydraulic design. The structure design shall be carried as per provision of IS code. The agency has to get their structure drawing checked and approved by any govt. Engineering college approved by consultant.(Set-1)(Complete cost for sub head above)	set	1						
B	RCC Suitable size mechanical Bar Screen chamber with minimum free board 300 mm and minimum size 1.0 mx1.0mx0.40 m SWD, Bar size min. 5x10 mm (SS) spacing max. 10mm and additional manual suitable size SS Bar screen is installed at suitable angle at the inlet of raw sewage sump before pumping and mechanical system to collect and lifts/transport the screening material . The unit shall be designed for peak flow , and one no. SS slotted additional manual fine screen 2 or 3mm thick after mechanical bar screen to be fixed in chamber itself. Inlet chamber of suitable size with SS manual operated spindle riser SS 316 gate shall also be provided before Bar Screen.(Complete cost for sub head above)								
C	Complete mechanical Bar Screen and SS slotted fine screen Electrical & mechanical Works , screening material collection and lifting system upto Ground formation level (excluding civil works) (Set-1) (Complete cost for sub head above)	set	2						
c)	RCC 2 nos., Suitable size Grit chamber with grit removal arrangement at one end of the chamber operated at a fixed interval. The grit chamber shall be suitable for surface overflow rate 959 m3 / m2 / day, The unit shall be designed for peak flow.								
	Cost of deflector (MOC- SS 316) at upstream and proportional flow weir (MOC- SS 316) at downstream of Grit Chamber. (Complete cost for sub head above)	set	2						

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1	2	3	4	5	6	7	8	9	10
D	Supply, installing, testing and commissioning vertical fully floodable type submersible drainage pump of non-corrosive material in close coupled design single stage, suitable for handling 20-40 mm(approx.) dia solids for transferring raw sewer from sump to outside the building with float switch for automatic start and stop arrangement with panel and wiring, chain and pulley, mechanical seal complete in all respect as per instruction of the Engineer in charge. (The shop drawing or the pumps along with its characteristics curves, model and technical data etc. are to be submitted for approval before purchase of pump).Star delta suitable starter complete in all respect for automatic/manual operation of pump, start and stop push button contactor with required overload production and single phase preventer.								
	Material of Construction (M.O.C): Corrosion Resistant in general : Casing — Cast Iron : Impeller — Ductile cast iron/SS : Bearings — Anti friction, prelubricated ball bearings, packed with grease for life. Motor: — Dry Motor with built in over load protection Protection - IP68. Insulation Class - F								
	RAW SEWAGE PUMP Capacity -300 LPM (min.) Head - 15 m Solid handling - 20-40mm								
i)	RAW SEWAGE PUMP Electrical & mechanical Works , excluding civil works (2 working+ 2 stand by) Total 4 Nos.(Complete cost for sub head above)	each	4						
ii)	Drainage Sump Pump-300LPM & 10 M head (2 Nos.)(Complete cost for sub head above)	each	2						
iii)	Sludge recirculation pump: 100 LPM & 10 m Head(2 Nos.)-subsidiary type(Complete cost for sub head above)	each	2						
E)	RCC Equalization tank with hydraulic retention time Min.6 Hrs HRT of STP designing Average flow with suitable Size free Board 500 mm, the effluent of equalisation tank is agitated with diffused air that is fed by an air blower, including pipe non-corrosive material and its complete system.								
i)	Equalisation tank Electrical & mechanical Works , excluding civil works (Set-1)(Complete cost for sub head above)	set	1						
F)	RCC Moving bed Bio Reactor (MBBR) with minimum 4hr. retention time of STP designing Average flow rate for each reactor of suitable size with Air grid CPVC/SS -316 pipe material of construction or corrosion resistant material, Air diffusers (fine bubble), HDPE approved make Bio media for each aeration tank, with minimum water depth of 3.8 m.(media - MM Aqua or approved by HSCC.(Complete cost for sub head above)								
i)	Moving bed Bio Reactor - Electrical & mechanical Works , excluding civil works -(4 nos.)(Complete cost for sub head above)	set	4						
G)	ROTARY AIR BLOWERS Providing and installation of Rotary air blowers for air scouring, driver through v-belt or directly coupled through flexible coupling. Motor shall be of suitable HP for 400-440 volts, ,1500RPM, 3 phase, along with air filter, non-return valve, safety valve, base plate and necessary air piping fittings, valves, flowmeters etc. (Blower capacity - 100 cfm at 4000 mm wc(minimum) shall be provided as per detail design calculation. It is use for equalisation tank and MBBR reactor - (2 working +2 stand by) Blowers shall be fully automatic. with fine bubble Air diffusers (tubeler type, Rating -5 -6 cfm at normal working condition, MOC diaphragm- Neoprene/silicon) - Complete including Electrical & mechanical Works , excluding civil works. Make of diffuser - Rehau, Techpro , OTT, MM Aqua Make of Blowers- Kay, Everest , Usha , Swam								
	ROTARY AIR BLOWERS - Electrical & mechanical Works , excluding civil works (Complete cost for sub head above)	SET	6						
H)	RCC secondary tube settler - maximum Hydraulic loading 1.75 cu.m/sq.m/hr /1.5 cu.m/sq.m./hr. respectively and with approved quality media with minimum water depth of 2.4 m.+ Free board & hopper bottom. The lamina clarifier media shall be of acrylic plate min. 10 mm thick (tube MM Aqua or approved by HSCC)								
	Tube settler - Electrical & mechanical Works , excluding civil works (Set-2)(Complete cost for sub head above)	set	2						
I)	Providing and fixing of OxiLyte (Mixed Oxidant) Generation System, based on ECA Technology, producing non toxic mixed Oxidant Solution 50 ltrs/hr at 1000 ppm of Oxidant Concentration . The solution should be at a pH 3+-0.5 suitable for 24x7 operations should produce 1200 litre per Day. The system should be supplied complete with appropriate dosing pumps , valves, piping, fittings, chemical dosing tank etc. complete in all respect. with auto flushing system.								
I)	OxiLyte (Mixed Oxidant) Generation System - Electrical & mechanical Works , excluding civil works (Set-2)(Complete cost for sub head above)	EACH	2						
J)	RCC supernatant tank/Filter feed tank minimum 300 cu.m capacity with following filter feed pumps -(Complete cost for sub head above)								

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1	2	3	4	5	6	7	8	9	10
K)	FILTER FEED PUMPSETS Providing and installation vertical inline single/multistage centrifugal pumping set with CI body, SS impeller, coupled with totally enclosed fan cooled induction motor mounted on common structural base plate with all pump accessories complete as per specifications inclusive rubber vibration eliminators motor suitable for 415 volts, 2900 RPM, 3 phase 50 HZ. A/c supply. Type of pump - Horizontal Capacity -400LPM (Mini.) Head - 30 M (2working +2stand by) - 4 nos. Filter feed tank & Pumps - Electrical & mechanical Works , excluding civil works(Complete cost for sub head above)	EACH	4						
L)	MULTI GRADE FILTER Providing and installation of mild steel pressure vessel (as per IS:2825) 6 mm thick natural rubber lining fabrication standard multi grade filter complete in all respects, with dished ends, supporting legs, manhole cover, frontal pipe work fitting with valves. Plant shall be provided with inlet, outlet pressure gauge, sample cocks, charge of filter media graded sand and internals consisting of strainers fitted on plate for collection. Dia of vessel - 1000mm (minimum) & 1.5 m height Shell thickness -6mm (minimum.) Filtration rate - 20,000 lph/sqm (min.) & Dish end thickness-8mm (minimum.) Nozzle plate -10mm thick (minimum.) Manhole -450mm Total capacity -400 LPM each Filter, complete (mini.) MULTI GRADE FILTER - Electrical & mechanical Works , excluding civil works-2 nos.(Complete cost for sub head above) (Complete cost for sub head above)	set	2						
M)	ACTIVATED CARBON FILTER Providing and installation of mild steel pressure vessel (as per IS:2825) 6 mm thick natural rubber lining fabrication standard multi grade filter complete in all respects, with dished ends, supporting legs, manhole cover, frontal pipe work fitting with valves. Plant shall be provided with inlet, outlet pressure gauge, sample cocks, charge of approved quality activated carbon media. Provision of backwash and recharging of activated carbon etc. complete Depth of Activated carbon media- 1.0 m Activated carbon type-(950 IV 4/8 mesh) Dia of vessel -1100mm (minimum)& 1.6 m ht. Shell thickness -6mm (minimum.) Dish end thickness-8mm (minimum.) Nozzle plate -10mm thick (minimum.) Manhole -450mm capacity -400LPM. (minimum.) ACTIVATED CARBON FILTER - Electrical & mechanical Works , excluding civil works-2 nos.(Complete cost for sub head above)	set	2						
N)	RCC 2 nos. Suitable size sludge sump of min. capacity 20 cu.m with min. free board 500 mm. The sludge of sludge sump is agitated with diffused air that is fed by an air blower (Common for MBBR tank), including pipe non-corrosive material and its complete system. Cost of Screw type sludge feed pump set with CI body, SS screw and shaft coupled with to a totally enclosed fan cooled induction motor complete with CPVC / SS 304 piping's, sluice valves, non return valves, fittings etc as required. Motor suitable for 415 volts, 3 phase 50Hz. A/c supply with control auto start float switch / level controller for automatic operation - Electrical & mechanical Works , excluding civil works (2 Nos.) SLUDGE FEED PUMP-(2 Nos) Capacity -150 LPM(minimum) Head - 20 m Type of pump - Screw type(Complete cost for sub head above)	set	2						
O)	Cost of centrifuge including drive, feeding arrangement, withdrawn arrangement, MOC- All wetted part SS 304, etc complete with PE Dosing System (Each set consist of 1 No.1000 ltr capacity dosing tank with 2 nos positive displacement dosing pump of min. capacity 50 LPH, CPVC / SS 304 pipings,valves, fittings etc as required(One set) Capacity -150 LPM(minimum) Type - Solid bowl Make - Alfa, humboldt ,Penwalt(Complete cost for sub head above)	set	1						
P)	RCC 2 No. suitable size treated water tank of minimum 250 cu. M capacity with min.free board 500 mm(1 unit) Treated Water Transfer Pump Sets- 300LPM & 30 m head(Complete cost for sub head above)	set	2						
Q)	Ultra Filtration System (UF) - 2 Sets(Complete cost for sub head above) Supplying, installing, testing and commissioning of UF System piping and Valves with all the required accessories & chemical cleaning system, complete in all respects. UF Module (Hollow Fibre -outside in type porocity 0.04- 0.09 micron) including micron cartridge filter in SS 304, Pneumatic Valve, PLC Electrical Panel, flow meter, compressor and all other accessories making the system complete Flow rate : 15 cum/hr	set	2						

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1	2	3	4	5	6	7	8	9	10
	Inlet TSS :- 20 mg/lit								
	Make : Norit, Toray, Koch, Dow- (No. Of unit -2)								
	Membrane Type :- Pressure Feed Mambrene having life of atleast 4 years or 10 lac ppm hrs when compared with chlorine tolerance capacity in working hour with respect to PPM of chlorine dosing. Out to in process								
	No. of UF Membrane - As per Manufacturer								
	UF Feed Pump								
	Capacity : 15m3/hr each (2W + 2S)								
	Head : 35 Mts (or as per manufacturer)								
	RPM : 2900								
	Motor Efficiency Class - IE2								
	Supply, installation, testing & commissioning of UF pre fine filtration. It can be micron filter or Bag filter or as per vendor design. The MOC of housing of filter shall be SS 304								
	Supplying, installing, testing, commissioning of centrifugal Vertical UF Backwash pumps with Complete SS - 304 with motor, pressure gauge with isolation cock, Isolation valve, NRV on delivery line. Isolation valve, strainer at suction. The pump shall be suitable for 415±10% volts 3 phase AC supply.								
	Capacity : - 25 m3/hr								
	Head : - 35 m (or as per manufacturer)								
	No. of Pumps:2 Nos.								
	Note-CIP pumps can be common with item no.c								
	Motor Efficiency Class - IE2								
	Supplying, Installation, testing and commissioning of mixed oxident dosing system comprising of Sintex Tank with inlet/ outlet connection, piping and valves alongwith metering pump of 0-25 LPH for dosing.								
	Supplying, Installation, testing and commissioning of CEB Dosing system comprising of Sintex Tank with inlet/ outlet connection, piping and valves alongwith metering pump of 0-12LPH for dosing.								
	Supply installation commissioning of PLC control panel with all automation required like Pneumatic valves, piping in UPVC PLC and other required accessories.								
	Supply, installation & commissioning of HDPE backwash tank of 2000 Litre capacity(minimum) including required level controller								
R)	Providing and fixing vertical in line SS centrifugal pumps with CI volute and SS impellar and with stainless steel shaft, mechanical seal and chrome steel shaft sleeve, connected to a TEFC induction motor suitable for 400/440 volts,1500 RPM, 3 phase 50 cycles A.C. supply having IP 55 protection enclosure. complete with base frame, vibration eliminating pads, nuts and bolts, pressure gauge on delivery side etc. with suction strainer (Necessary RCC foundations as per requirement and as per instructions shall be provided by the agency)								
	Irrigation Pump in STP								
	Capacity : 450 lpm (Each)								
	Head : 45 m								
	Power : 5.0 HP								
	Complete pump set(Complete cost for sub head above)	each	4						
	Providing and fixing C.I. "Y" Type suction strainer with stainless steel perforated sheet screen,flangfd ends iner installed outside water tanks. (Make: Leader / Zoloto / Kartar or equivalent)								
	50/80 mm dia (min.) or required size and required number(1 Set)(Complete cost for sub head above)	set	2						
	Providing and fixing gun metal or bronze ball valves/butterfly valve/NRV/Rotameter, tested to 15.00 Kg / cm2, screwed end connections complete . (Make: Leader/ Zoloto or equivalent)								
	80/50 mm NB (min.) or required size and number(1 Set)(Complete cost for sub head above)	set	2						
	Providing and fixing heavy duty floating flange EPDM rubber expansion bellows with unit control (tie rod & gusset plate) as per manufacturers specifications of standard length complete with all accessories and a working pressure not less than 16 Kg./sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.								
	80/50 mm NB (min.) or required size and 2 numbers(1 on suction and 1 on delivery)(Complete cost for sub head above)	set	2						
s)	RCC Treated water tank of minimum 100 cu.m capacity with min. free board 500 mm(1 unit)- excluding civil work(Complete cost for sub head above)	set	1						
T)	RCC UF Permeate tank of minimum 100 cu.m capacity with min. free board 500 mm(1 unit)-excluding civil work(Complete cost for sub head above)	set	1						
u)	Providing and fixing Hydropneumatic filter press of 24 plates 1000 x 1000mm size, with suitable sludge pump(screw type) along with piping, fittings valve etc. complete in all respects.								
i)	Filter press & sludge pump(screw type) with SS Shaft and Rotor - 3 m3/Hr, 40 m Head - Electrical & mechanical Works , excluding civil works(Set-I)(Complete cost for sub head above)	set	2						

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v)	Providing and fixing dust and vermine proof cubical type motor control panel center for the various pumps, blower etc. required. It is fabricated from 2mm thick CRCA sheet with stove enamelled finish and comprising of: Panel should have at least 20% spare feeders.								
i)	One incoming main of 200 A MCCB or of required								
ii)	MCCB/MPCB, one for each motor								
iii)	Fully automatic DOL/star delta starters suitable for different motors/pumps/exhaust fans used in the ETP. Upto 7.5 HP DOL may be used and above star/delta starter used with push buttons one for each motor and on/off indicating neon lamps.								
iv)	Single phasing preventers of appropriate rating for each motor.								
v)	rotary type selector switch								
vi)	Panel type ampere meters, one for each motor shall be with rotary selector switch to monitor line currents.								
vii)	Panel type volt meters, on incoming main with rotary selecting switch to monitor voltage between phase to neutral and phase to phase.								
viii)	Neon phase indicating lamps and indicating lamp for each motor on incoming mains.								
ix)	Rotary switch for manual or auto operation for each pump								
x)	Fully taped separate aluminum bus bar of required capacity for normal and emergency supply.								
xi)	The panel shall be pre-wired with coded wiring. All intercnnting wiring from incoming main to switchgear, meters and accessories within the switchboard panel shall have suitable copper ferrules (Complete 1 set)(Complete cost for sub head above)	set	1						
W)	Electrical works(including supply, installation and termination of cables of suitable size as per HP of all pumps with all structural supports, clamps and cable trays as per approved design/specifications, installation will be as per relevant Indian standard and CPWD specification along with control cable of suitable size),(1 lot). Axial exhaust Fan GI Sheet ducting for desire ventilation of Pump Room area as per approved Drawings. Any other electrical and mechanical item required to complete the work.(Set-1)(Complete cost for sub head above)	LOT	1						
X)	Providing and fixing digital type flow meter and energy meter etc. complete in all respects. (Set-1) & Providing and fixing lab. Equipments including digital type pH meter, COD kit, TDS kit, bicker, conical flask etc. complete in all respects. (Set-1)(Complete cost for sub head above)	set	1						
Y)	Rooms for Pumps & control panel (150sq.m.) (minimum size) - Electrical & mechanical Works , Ventilation fan & ducts with minimum air change 20 CFM and lighting etc.,excluding civil works.(Set-1)(Complete cost for sub head above)	set	1						
Z)	Providing nitrification tank with 3 hr retention time (min) with SS body agetator so that the Nitrogen and phosphorous level reduces to required level as per S.P.C.B Norms. (set-2)(Complete cost for sub head above)	set	2						
	Note: The cost of chemical & manpower for trial run for period of two month from the date of handing over obtaining approval from Local Pollution Department including the cost of consumables complete as specification as directed .Obtain required no. of test report of treated/raw sewer during trial run. No additional payment shall be made on this account.								
	Complete STP work as mentioned above								
	SUB TOTAL(Sewage Treatment Plant)-[Total of Sub Head STP(a) to (z)](Complete cost for sub head above)	SET							
	Operation and maintenance Cost (STP & ETP)								
	Testing charges of Raw and treated effluent for all the required parameter from approved lab (after defect and liability period)-1 set of test in every 3 months)(Complete cost for sub head above)	Each	4						
	Providing chemical and consumables for satisfactory operation of STP etc. completed in all respect in all respect excluding cost of electricity and manpower and spare parts during defect liability period i.e. 1 year and also including the cost for providing the on plant training to the respective personnel's for operation and maintenance of STP.	Year	1						
	Providing (operator & one Helper) i.e. manpower to operate the STP in each shift. In case the additional manpower required for proper operation, the same will be considered as part of this item only.								
	Helper - 3 no./day(i.e one in each shift)	Months	3						
	technical operator - 2 no./day	Months	2						
	Supervisor (1 No. Per day)	Months	1						
	AMC of all equipment's, components and spares of STP after one year defect liability period. The consumables will be reimbursed by owner as per actual cost.	Year	1						
	Subtotal (O & M)								
	Grand total STP (Including O&M)								

Name of Work: Quotation & Rates for Construction of proposed Hospital, Medical college, Medical College Labs, Library & Admin, Type-II, Type-III, Type-IV, Type-V, Director bungalow, UG Hostel(Male), UG Hostel (Female), Intern Hostel, Residents Hostel, Dinning-I, Dinning-II, Mortury, IMA Office at Chandarpur Maharashtra- Fire Fighting Works											
FIRE FIGHTING											
Item No	Ref. No.	Description Of Item	Unit	TOTAL QTY.	Supply Rates (without GST)	Supply Amount (without GST)	GST for Supply(%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount (without GST)	GST for I/T/C(%)	
1.00	2.00		3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
		Note: Based on the tender drawing the agency has to prepare the internal & external fire fighting shop drawing and obtain the approval of the same before start of work									
A		FIRE FIGHTING EQUIPMENTS & PUMPS									
1.00	NS	Providing and fixing Aluminium shutter (size 1200 (L) x 2100 (H) mm), The shutter size shall be as per approved drawing capable of accommodating fire hose reel, fire hydrant, hose pipe, fittings & accessories. The box shall have a single or double glazed front glass door (with 4 mm thick glass) with lock & key arrangement & shall be painted with Fire red as per IS:5, shade no. 536 complete in all respects. (For Internal Hydrant) (Excluding the cost of alluminium work which will be paid as per civil work items)	Each	1.00							
2.00	NS	Supplying and Fixing of Fire Man's axe with heavy insulated rubber as per standard conforming to IS 926	Each	1.00							
3.00	NS	Providing and fixing Hose Cabinet for External Hydrant Stand post type of size (750 x 600 mm x 300 mm) fabricated from 2 mm thick SS sheet having openable glazed door shutter with 4mm thick glass suitable to accommodate hydrants, 2 Nos. canvas hose pipe bearing ISI mark Under IS:639-992 type B (not less then 30 Meter length) and branch pipe including necessary locking arrangements, painting inside and external part shall be natural polished in matt finish including SS 304 angle stand and PCC foundation 1:2:4 complete with locking arrangement and inbuilt key box.	Each	1.00							
4.00	NS	Supply, erection, testing & commissioning of Exit Glow Sign Board of size 200mm x 350 mm wall mounting signage consisting of photo luminescent coating, non radioactive on acrylic cover									
	a)	Single sided luminescent exit glow sign board	Each	1.00							
	b)	Double sided luminescent exit glow sign board	Each	1.00							
5.00	NS	Supplying and Fixing vane type Waterflow switch with contacts suitable for installation on 50 mm to 150 mm dia pipeline for a service pressure upto 20 Kg/sq.cm.	Each	1.00							
6.00	NS	Providing, Fixing, Testing and Commissioning of Sprinkler Installation Control Valve of Cast iron body and brass / bronze working parts comprising of water motor, alarm, bronze seat clapper and clapper arm, hydraulically driven mechanical gong bell to sound continuous alarm when the Sprinkler system activates, pressure gauges, emergency releases, strainer, pressure switch, cock valve complete with drain valve and bypass, test control box, ball valves, MS pipe of required size, flanges, orifice plate, gasket etc. of size 200/150 mm dia, as required.	Each	1.00							
7.00	NS	Providing and fixing Sand Bucket with Stand (6 Bucket) as per site conditions	Each	1.00							
8.00		Providing and fixing Modular type ceiling mounted clean UL listed & FM Approved agent (FE-36) Hexafluoropropane type fire extinguisher, ISI Marked IS 15683:2006, Gas listed under EPA SNAP, having sprinkler with glass bulb rated at 68 deg.C, CE MArked Valve, suitable for Class A,B and C type of fires, conforming to ISO 14520, FM approved and UL listed.- For Electrical, UPS, Server, Battery Rooms etc.									
	a)	Capacity 10 Kg - One in each Electrical Room	Each	1.00							
9.00	NS	K (Kitchen) type 6 Ltr. Stored Pressure type Fire Extinguisher , with UGTS Pressure Gauge, Deep Drawn, Stainless Steel Body, EPDM Rubber Hose with SS Nozzle, CE Mark Valve with Safety Release Provision, Helium Leak Detection Tested, Controllable discharge mechanism applicable on Class K (Kitchen) Fire, maintenance, care and refilling as per IS 2190:2010	Each	1.00							

Item No	Ref. No.	Description Of Item	Unit	TOTAL QTY.	Supply Rates (without GST)	Supply Amount (without GST)	GST for Supply(%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount (without GST)	GST for I/T/C(%)	
1.00	2.00		3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
10.00	NS	Providing & fixing of IS marked (IS: 13386-1992) Mechanical foam type fire extinguishers 50 ltrs consisting of welded M.S. trolley mounted cylindrical body, squeeze lever discharge valve fitted with pressure discharge hose, discharge nozzle, trolley etc. finished externally with red enamel paint and fixed to wall with brackets complete with internal charges - For DG Set, Substation area	Each	1.00							
11.00	NS	Providing and fixing 9 liters capacity fire extinguisher Water type Gas pressure , fixed to wall. With EPDM Rubber Hose pipe with test certificate of helium leak detection complete to IS 15683-2006 & ISI marked	Each	1.00							
12.00		Suppression System									
(i)		S/F 10 LB capacity NOVEC 1230 DLP Assembly with Automatic valve, push in connector for tube, 5 LB NOVEC 1230 gas, mounting bracket, end of line adopter and low pressure switch for monitoring system activation of automatic linear pneumatic tube detection system complete etc. as reqd as one job make: Fire Trex /Seimens / UTC	JOB	104.00							
(ii)		S/F 2.5 LB capacity NOVEC 1230 DLP Assembly with Automatic valve, push in connector for tube, 2.5 LB NOVEC 1230 gas, mounting bracket, end of line adopter and low pressure switch for monitoring system activation of automatic linear pneumatic tube detection system, complete etc. as reqd as one job make: Fire Trex /Seimens / UTC	JOB	10.00							
(iii)		S/F linear pneumatic heat detection tube UL marked and suppression system operated on 92-100 deg. Cent temp. With all necessary fittings and supports, fixing in the existing electrical panel board, complete etc as required at site . Make: FireTraco/Srevo System/Fire System/Fire TEC	MTR	1,650.00							
(iv)		S/F audio visual alarm system for automatic linear fire trace tube detection system, complete etc as required at site	Each	210.00							
13.00		Supplying, Installation, Testing & Commissioning modular construction master control annunciation panel for sprinkler with provision for requirer No. of Zone (30% additional spares),eachsprinkler hydrant will have atleast 4 zone on each floor as approved by engineer.The panel shall have but not limited to the following arrangement.									
a)		Indication of Zone sprinkler									
b)		Indication of zone fault									
c)		Fire/fault hooter									
d)		Alarm cancel for fire/fault									
e)		Battery for emergency back up of 4 Hrs.	Set	10.00							
14.00	NS	Providing and fixing SS flexible sprinkler drop unbraided 20 mm NB UL listed having a working pressure of 12 kg/sq.cm complete with GI nipple, sprinkler fixing adaptor and fixing clamps complete as per Manufacturer's catalogue and decorative 65 mm dia CP brass/SS flange for fixing sprinkler below false ceiling									
a)	NS	20mm NBx700 mm long	Each	1.00							
b)	NS	20mm NBx1000 mm long	Each	1.00							
c)	NS	20mm NBx1200 mm long	Each	1.00							
d)	NS	20mm NBx1500 mm long	Each	1.00							
15.00	NS	Providing and fixing of 150mm dia deluge valve of cast iron body and brass/bronze working parts comprising of water motor, alarm, bronze seat clapper and clapper alarm, pressure gauges, emergency releases, pressure switch cock valve complete with drain valve, ball valve, flanges, gasket etc.	Each	1.00							
16.00	NS	Providing and fixing heavy duty floating flange EPDM rubber expansion joint with unit control(tie rod & gusset plate) as per manufactures specifications of standard length complete with all accessories and a working pressure not less than 16 kg/sqcm including rubber gaskets, flanges, nuts, bolts & washers complete as required.									
a)	NS	65 mm dia	No.	1.00							
b)	NS	100 mm dia	No.	1.00							

Item No	Ref. No.	Description Of Item	Unit	TOTAL QTY.	Supply Rates (without GST)	Supply Amount (without GST)	GST for Supply(%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount (without GST)	GST for I/T/C(%)	
1.00	2.00		3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
c)	NS	150 mm dia	No.	1.00							
d)	NS	200mm dia	No.	1.00							
17.00		Providing & fixing Puddle Flanged including 40 cm long GI pipe piece welded / threaded with MS plates 450x450x6mm thick with both end screwed / flanged		-							
a)	NS	For 50 mm dia pipe	Each	1.00							
b)	NS	For 100 mm dia pipe	Each	1.00							
c)	NS	For 80 mm dia pipe	Each	1.00							
d)	NS	for 150 mm dia pipe	Each	1.00							
e)	NS	for 200 mm dia pipe	Each	1.00							
f)	NS	for 300 mm dia pipe	Each	1.00							
18.00		Supplying, installing, testing and commissioning of Diesel Engine Driven Fire Pump suitable for automatic operation consisting of the following (as per CPWD specifications PartV 1985.) (For Hydrant system & Sprinkler system).									
a)		Horizontal centrifugal type multi-stage, fire pump (A) Factory Assembled (factory fitted) with stainless steel impeller CI casing, SS shaft & mechanical seal complete of following capacity and Head so as to ensure a minimum pressure of 3.0 kg per sq.cm. at the highest & farthest outlet at the specified flow, complete with necessary strainer pressure gauge on the delivery side etc. including by pass arrangement for periodical testing of the working of the pump set as required. The pump shall be provided with mechanical seals. (B) The Pump Set shall be inspected at factory before dispatched and tested as design head the testing & inspected charges will bound by agency)									
b)		Water cooled cold starting type multi cylinder 4 stroke diesel engine, developing suitable BHP at 1500 RPM for the above pump set with automatic starting mechanism, cooling system shall be with radial cool engine, maintenance free batteries, battery charge unit, flexible coupling with the pump, common bed plate for mounting diesel engine fuel day tank fuel piping and pump and vibration damping arrangement by cushy foot mounting as required complete in all respects.									
c)		The engine shall be capable to drive the pump at 150% rated discharge at 65% head and shall be suitable for 10% overload capacity for one hour in any period of 12 hrs. continuous run.									
d)		Common bed plate fabricated from mild steel channel or cast iron type.									
e)		Isolation Valve									
f)		Suitable cement concrete pump foundation & vibration damping arrangement with cushy foot mounting as required.									
(i)	NS	Capacity 2400 LPM and Head 88 Metres	Each	1.00							

BOQ OF ELECTRICAL WORKS(NON SCHEDULE ITES) FOR CONSTRUCTION OF HOSPITAL AND MEDICAL COLLEGE AT CHANDRAPUR, MAHARASHTRA

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Only			Installation, Testing and Commissioning			
					Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)	
	SUBHEAD 1: H.T. SUB STATION.										
1.01	33kV HT Panel -Grid Substation										
	Supply, erection, testing and commissioning of 7 panel, 33 kV, 3 Phase, 50 Hz., metal clad, dead front, 1000 MVA rupturing capacity Vacuum Circuit Breaker Incoming & Outgoings as following, including necessary control cabling interconnection between transformer and LT panel, battery charger panel etc door interlocking and expandable as required ,including Foundation, as per technical Specification & complete in ready to use condition										
	A. INCOMER :										
	i) 2 No. VCB having following										
	1 No. 1250A, 33kV, 3 Phase, 50Hz., metal clad, dead front, 1000 MVA rupturing capacity, Fully Draw out type, Vacuum Circuit Breaker (VCB).										
	1 set of 33kV/110V -110 V Potential Transformers with HRC fuses for metering & protection.										
	1 Set of Phase indicating lamps with HRC fuses.										
	1 No. Digital voltmeter.										
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.										
	Push button for ON, OFF & TRIP circuit healthy.										
	1 set of 800/5-5A Current Transformer for metering and protection.										
	1 No. digital Ammeter with selector switch to select R, Y or B phase current.										
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.										
	Digital frequency meter, Digital Tri vector meter.										
	1 Set of undervoltage relay and Overvoltage relay.										
	Trip circuit supervision relay, Auxiliary relays with shunt trip coil (WTI & Door open trip).										
	1 No. Master Trip relay.										
	1 No. Digital Power factor meter.										
	8 window annunciator.										
	1 no. Phase reversal Relay.										
	b) BUSBARS:										
	33kV, 1000 MVA, 1250 Amps Three Phase busbars of copper.										
	c) OUTGOINGS:										
	i) 4 No. VCB each having the following:										
	1 No. 1250A, 33kV, 3 Phase, 50Hz., metal clad, dead front, 1000 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).										
	1 set of 33kV/110V-110 V Potential Transformers with HRC fuses for metering & protection.										
	1 Set of Phase indicating lamps with HRC fuses.										
	1 No. Digital voltmeter.										
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.										
	Push button for ON, OFF,TRIP&TRIP circuit healthy.										
	1 No. Digital ammeter with selector switch and one set of C.T 150/5-5 A, For measurement & protection.										
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.										
	Digital frequency meter,Digital Tri vector meter.										
	1 Set of undervoltage relay and Overvoltage relay.										
	Trip circuit supervision relay,Auxiliary relays with shunt trip coil.										
	8 window annunciator.										
	1 No. Master Trip relay.										
	1 No. Digital Power factor meter.										
	1 no. Restricted Earth Fault relay with one set of CTs including necessary cable connection complete ready to use.										
	d) BUS COUPLER:										

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	i) 1 No. VCB having following:									
	1 No. 1250A, 33kV, 3 Phase, 50 Hz, metal clad, dead front, 1000 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP.									
	Push button for ON and OFF.									
	33kV HT Panel -Grid Substation AS MENTIONED ABOVE	Set	MR	1						
1.02	11kV HT Panel -Grid substation									
	Supply, erection, testing and commissioning of 11 panel, 11 kV, 3 Phase, 50 Hz., metal clad, dead front, 500 MVA rupturing capacity Vacuum Circuit Breaker Incoming & Outgoings as following, including necessary control cabling interconnection between transformer and LT panel, battery charger panel etc door interlocking and expandable as required ,including Foundation, as per technical Specification & complete in ready to use condition									
A.	INCOMER :									
	j) 2 No. VCB having following									
	1 No. 1250 A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Draw out type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V -110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF & TRIP circuit healthy.									
	1 set of 800/5-5A Current Transformer for metering and protection.									
	1 No. digital Ammeter with selector switch to select R, Y or B phase current.									
	1 Set of Microcontroller based numerical relay having 4 element relay (30/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter, Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay, Auxiliary relays with shunt trip coil (WTI & Door open trip).									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	8 window annunciator.									
	1 no. Phase reversal Relay.									
	b) BUSBARS:									
	11kV, 500 MVA, 1250 Amps Three Phase busbars of copper.									
	c) OUTGOINGS:									
	i) 8 No. VCB each having the following:									
	1 No. 1250A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V-110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF,TRIP&TRIP circuit healthy.									
	1 No. Digital ammeter with selector switch and one set of C.T 150/5-5 A, For measurement & protection.									
	1 Set of Microcontroller based numerical relay having 4 element relay (30/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter,Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay,Auxiliary relays with shunt trip coil.									
	8 window annunciator.									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	1 no. Restricted Earth Fault relay with one set of CTs including necessary cable connection complete ready to use.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	d) BUS COUPLER:									
	i) 1 No. VCB having following:									
	1 No. 1250 A, 11kV, 3 Phase, 50 Hz, metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP.									
	Push button for ON and OFF.									
	11kV HT Panel -Grid substation AS MENTIONED ABOVE	Set	MR	1						
1.03	11kV HT Panel : ESS-1(Hospital)									
	Supply, erection, testing and commissioning of 8 panel ,11 kV, 3 Phase, 50 Hz., metal clad, dead front, 500 MVA rupturing capacity Vacuum Circuit Breaker Incoming & Outgoings as following, including necessary control cabling interconnection between transformer and LT panel, battery charger panel etc door interlocking and expandable as required ,including Foundation, as per technical Specification & complete in ready to use condition									
	A. INCOMER :									
	j) 2 No. VCB having following									
	1 No. 1250 A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Draw out type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V -110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF & TRIP circuit healthy.									
	1 set of 800/5-5A Current Transformer for metering and protection.									
	1 No. digital Ammeter with selector switch to select R, Y or B phase current.									
	1 Set of Microcontroller based numerical relay having 4 element relay (30/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter, Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay, Auxiliary relays with shunt trip coil (WTI & Door open trip).									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	8 window annunciator.									
	1 no. Phase reversal Relay.									
	b) BUSBARS:									
	11kV, 500 MVA, 1250 Amps Three Phase busbars of copper.									
	c) OUTGOINGS:									
	j) 5 No. VCB each having the following:									
	1 No. 630A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V-110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF,TRIP&TRIP circuit healthy.									
	1 No. Digital ammeter with selector switch and one set of C.T 150/5-5 A, For measurement & protection.									
	1 Set of Microcontroller based numerical relay having 4 element relay (30/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter,Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay,Auxiliary relays with shunt trip coil.									
	8 window annunciator.									
	1 No. Master Trip relay.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	1 No. Digital Power factor meter.									
	1 no. Restricted Earth Fault relay with one set of CTs including necessary cable connection complete ready to use.									
	d) BUS COUPLER:									
	i) 1 No. VCB having following:									
	1 No. 1250 A, 11kV, 3 Phase, 50 Hz, metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP.									
	Push button for ON and OFF.									
	11kV HT Panel : ESS-1(Hospital) AS MENTIONED ABOVE	Set	MR	1						
1.04	11kV HT Panel :ESS-2 (Academic)									
	Supply, erection, testing and commissioning of 6 panel ,11 kV, 3 Phase, 50 Hz., metal clad, dead front, 500 MVA rupturing capacity Vacuum Circuit Breaker Incoming & Outgoings as following, including necessary control cabling interconnection between transformer and LT panel, battery charger panel etc door interlocking and expandable as required ,including Foundation, as per technical Specification & complete in ready to use condition									
	A. INCOMER :									
	i) 2 No. VCB having following									
	1 No. 630 A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Draw out type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V -110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF & TRIP circuit healthy.									
	1 set of 800/5-5A Current Transformer for metering and protection.									
	1 No. digital Ammeter with selector switch to select R, Y or B phase current.									
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter, Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay, Auxiliary relays with shunt trip coil (WTI & Door open trip).									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	8 window annunciator.									
	1 no. Phase reversal Relay.									
	b) BUSBARS:									
	11kV, 500 MVA, 630 Amps Three Phase busbars of copper.									
	c) OUTGOINGS:									
	i) 3 No. VCB each having the following:									
	1 No. 630A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V-110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF,TRIP&TRIP circuit healthy.									
	1 No. Digital ammeter with selector switch and one set of C.T 150/5-5 A, For measurement & protection.									
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter,Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay,Auxiliary relays with shunt trip coil.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	8 window annunciator.									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	1 no. Restricted Earth Fault relay with one set of CTs including necessary cable connection complete ready to use.									
	d) BUS COUPLER:									
	i) 1 No. VCB having following:									
	1 No. 630 A, 11kV, 3 Phase, 50 Hz, metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP.									
	Push button for ON and OFF.									
	11kV HT Panel :ESS-2 (Academic) AS MENTIONED ABOVE	Set	MR	1						
1.05	HT Panel For ESS-3 (Residential)									
	Supply, erection, testing and commissioning of 7 panel ,11 kV, 3 Phase, 50 Hz., metal clad, dead front, 500 MVA rupturing capacity Vacuum Circuit Breaker Incoming & Outgoings as following, including necessary control cabling interconnection between transformer and LT panel, battery charger panel etc door interlocking and expandable as required ,including Foundation, as per technical Specification & complete in ready to use condition									
	A. INCOMER :									
	i) 2 No. VCB having following									
	1 No. 630A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Draw out type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V -110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF & TRIP circuit healthy.									
	1 set of 800/5-5A Current Transformer for metering and protection.									
	1 No. digital Ammeter with selector switch to select R, Y or B phase current.									
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter, Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									
	Trip circuit supervision relay, Auxiliary relays with shunt trip coil (WTI & Door open trip).									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	8 window annunciator.									
	1 no. Phase reversal Relay.									
	b) BUSBARS:									
	11kV, 500 MVA, 630 Amps Three Phase busbars of copper.									
	c) OUTGOINGS:									
	i) 4 No. VCB each having the following:									
	1 No. 630A, 11kV, 3 Phase, 50Hz., metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 set of 11kV/110V-110 V Potential Transformers with HRC fuses for metering & protection.									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 No. Digital voltmeter.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP, SPRING CHARGED, TRIP CIRCUIT HEALTHY.									
	Push button for ON, OFF,TRIP&TRIP circuit healthy.									
	1 No. Digital ammeter with selector switch and one set of C.T 150/5-5 A, For measurement & protection.									
	1 Set of Microcontroller based numerical relay having 4 element relay (3O/C+1E/F). Relay should have display of phase current and trip history.									
	Digital frequency meter, Digital Tri vector meter.									
	1 Set of undervoltage relay and Overvoltage relay.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Trip circuit supervision relay,Auxiliary relays with shunt trip coil.									
	8 window annunciator.									
	1 No. Master Trip relay.									
	1 No. Digital Power factor meter.									
	1 no. Restricted Earth Fault relay with one set of CTs including necessary cable connection complete ready to use.									
	d) BUS COUPLER:									
	i) 1 No. VCB having following:									
	1 No. 630A, 11kV, 3 Phase, 50 Hz, metal clad, dead front, 500 MVA rupturing capacity, Fully Drawout type, Vacuum Circuit Breaker (VCB).									
	1 Set of Phase indicating lamps with HRC fuses.									
	1 set of indicating lamps to indicate OPEN, CLOSE, TRIP.									
	Push button for ON and OFF.									
	HT Panel For ESS-3 (Residential) AS MENTIONED ABOVE	Set	MR	1						
1.06	HT APFC PANEL: Automatic Power Factor Controller Panel with Capacitor panel									
	Supply, Erection, Testing and Commissioning of 11 kV 1000 kVAR, 0.2% reactor, with 15% Over voltage 5 Steps APFC Panel with communication provision for Electrical parameters KWH, KVAH, PF, HZ and ON, OFF, TRIP, FAULT, Suitable Ventilation and Temperature Indications and Capacitor Bank: 1300 kVAR, 12.65kV, 3 phase capacitor Panel in star configuration along with cast resin/ resin impregnated air cooled series reactors, cast resin neutral CT in a closed container detailed as per technical specification.	Set	MR	1						
1.07	33kV/11kV -TRANSFORMER :Grid Substation									
	Supply, Installation, Testing & Commissioning of 10 MVA 3 phase, 33/ 11 kV outdoor, oil filled type Power Transformer, Dyn 11 vector group connection, having impedance as per IS, Transformer winding & Insulation : CRGO type core, 99.9% pure copper copper winding and neutral brought out for earthing, paper insulated Insulation & cooling : Class A insulation, Oil natural, Air Natural/ Oil Natural, Air Force (ONAN/ ONAF) type cooling. Suitable for continuously rated for full load, temperature rise not exceeding 45 deg C by thermometer in oil or 55 deg C by resistance. ON load tap changer on HT side with 2.5% step each, range (-) 15% and (+) 5% along with RTCC Panel. Primary side cable termination box shall be suitable for 33 KV, 2 x 3C X 300 Sqmm XLPE cable and 11 kV side terminal box shall be suitable for termination of 11 kV, 3 x 3C x 300 sq.mm XLPE AL. cable. Transformer should be as per IS standards or ammended upto date. Civil foundation as per the manufacturer recommendation is also in the scope. Price of civil work included in the items..									
	The transformer shall be supplied with following Fitting & Accessories:									
	All standard fitting viz Humidstat for Alarm and Trip									
	Transformer Oil Temperature Alarm & Tripping									
	Winding temperature relay unit with Alarm and trip									
	Oil Level Low Alarm with trip									
	Electronic temperature controlled with RTD.									
	Differential protection Relay									
	Gas Pressure Relays									
	OLTC Oil Surge Relay									
	3 No. 1 phase, 30 kV, 10 kA discharge current, class-II Surge arresting device for protection against lightning including Structural support for mounting lightning arrester on the body above HT bushing.									
	Buchholz relay of double float type with high gas pressure alarm & trip suitable for 24 volts DC supply. With wiring upto marshalling Box & RTCC Panel.									
	1 No. 650/5A, SP10, 10 VA, Protection class, CT after Neutral trifurcation point forbackup earth fault protection (51S).									
	Outdoor type Marshalling box with RS-485 communication port for BMS integration to monitor all transformer parameters or having 2 No. potential free contact for alarm, trip & annunciation (one for BMS and one for control system).									
	The transformers shall have bi-directional rollers, winding temperature indicator, oil temperature indicator and Buchholz relay with wiring up to the marshalling box and RTCC Panel complete. The transformers shall have first filling of oil, weather proof HT cable box. The transformer shall have suitable disconnecting chamber at the ends with min 8mm thick non-magnetic gland plate, including M.S. channel and suitable size foundation complete with earth terminals/ lifting lugs and other standard accessories as required, as per relevant IS to successfully test & commission the Power Transformer as described above and technical specification.	Each	MR	2						
1.08	11kV/433kV -TRANSFORMER :ESS-1(Hospital)									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Supply, installation, testing and commissioning of 2500 KVA , 11kV/ 0.433 kV, 3 Phase, 4 wire, 50 Hz., ON-AN Transformer, Dyn11 Vector group, copper bound with outdoor duty type, On load tap changer on HV Side range -15%, 0, +5% in the steps of 2.5% per step, type transformer with RTCC+AVR inclusive of all control cable. Cable box connection including cable adapter box at primary and secondary end (LT side) shall be connected through busduct/ cable, complete with all accessories including first filling of oil, double float buchholz relay protection, high winding temperature, oil temperture sensors and gauges etc. as per to IS 1180 ammended upto date, interconnection of control cables and accessories etc complete including Foundation .	Each	MR	4						
1.09	11kV/433kV -TRANSFORMER :ESS-2(Academic)									
	Supply, installation, testing and commissioning of 2000 KVA , 11kV/ 0.433 kV, 3 Phase, 4 wire, 50 Hz., ON-AN Transformer, Dyn11 Vector group, copper bound with outdoor duty type, On load tap changer on HV Side range -15%, 0, +5% in the steps of 2.5% per step, type transformer with RTCC+AVR inclusive of all control cable. Cable box connection including cable adapter box at primary and secondary end (LT side) shall be connected through busduct/ cable, complete with all accessories including first filling of oil, double float buchholz relay protection, high winding temperature, oil temperture sensors and gauges etc. as per to IS 1180 ammended upto date, interconnection of control cables and accessories etc complete including Foundation .	Each	MR	2						
1.10	11kV/433kV -TRANSFORMER : ESS-3(Residential)									
	Supply, installation, testing and commissioning of 630 KVA , 11kV/ 0.433 kV, 3 Phase, 4 wire, 50 Hz., ON-AN Transformer, Dyn11 Vector group, copper bound with outdoor duty type, On load tap changer on HV Side range -15%, 0, +5% in the steps of 2.5% per step, type transformer with RTCC+AVR inclusive of all control cable. Cable box connection including cable adapter box at primary and secondary end (LT side) shall be connected through busduct/ cable, complete with all accessories including first filling of oil, double float buchholz relay protection, high winding temperature, oil temperture sensors and gauges etc. as per to IS 1180 ammended upto date, interconnection of control cables and accessories etc complete including Foundation .	Each	MR	2						
1.11	BATTERY CHARGER PANEL Supply, erection, testing and commissioning of battery charger panel with 24 V DC continuous out put for control supply of HT panel complete 2 numbers battery of minimum 180 AH ampere hour capacity. Boost and Trickle charger suitable for above items. 1 No. AC Voltmeter (0-500Volt) 1 No. DC Voltmeter 1 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	Each	MR	4						
1.12	BUS DUCTS :									
	Supply, Installation, testing and commissioning of following rating 3 Phase, 4 Wire, sandwich construction Aluminium Bus Duct having 65kA short ckt for one Second with temperature rise of 55Deg. above ambient of 40deg. In extruded aluminium/ sheet steel housing suitable for operation on 415V, 50Hz AC supply with 50% neutral complete with all accessories bends, flange ends with adaptor box, Tinned copper laminated flexibles for all the panels , flexible joints, earth bus (minimum 2 runs of suitable rating aluminum strips), plug in point at required positions, expansion joints, transposition joint, end covers, ceiling/wall/ floor mounted support structure of painted/ powder coated with required hardware for installation, supporting arrangements, etc. Indoor type busduct shall be IP54 & Outdoor Busduct shall be IP65 protected . Outdoor /indoor duty type complete as per technical specifications and as requirement. Note- for outdoor installtion canopy will be mounted on bus duct for protection. Canopy Fabricated out of 1.2mm GI/CRCA powder painted									
	A) OUTDOOR TYPE BUSDUCT (IP65) with Canaopy Fabricated out of 1.2mm GI / CRCA Powder Painted.									
	i 4000 Amp	Meter	MR	80						
	i 3200 Amp	Meter	MR	40						
	iii 2000 Amp	Meter	MR	20						
	B) INDOOR TYPE BUSDUCT (IP54)									
	i 4000 Amp	Meter	MR	170						
	i 3200 Amp	Meter	MR	260						
	iii 2000 Amp	Meter	MR	40						

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1.18	Providing & Fixing of Safety Equipmet									
	i) Providing and fixing HT (33 kV) danger notice plate of 250 x 150 mm made of mild steel, atleast 2 mm thick and vitreous enameled white on both sides and with inscription in signal red colour on front side as required.	Each	MR	1						
	ii) Providing and fixing H.T. (11kV) 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.	Each	MR	4						
	iii) Providing and fixing M.V. danger notice plate of 200mmX150mm made of mild steel, atleast 2mm thick and vitreous enamelled white on both sides and with inscription in signal red colour on front side as required.	Each	MR	15						
	iv) Supply & erection of the following Safetyand testing Equipment including miscellanoes items like Clamps, nuts & Bolts , rawl plugs etc at sub;e laces in the Substation building as required.									
	a) G.I buckets of 4 nos of 5 Litres Capacity duly painted white inside and red oxide paint out side and witten 'FIRE' with white paint & Filled with Dry sand and mounted on M.S angel iron bracket of Size 50x50x6mm thick and 1200mm long including grouting in wall/ floor etc as required .	Each		4						
	b) Supplying, storing, handling and fixing in position First Aid Medical Box complete as per technical specifications as required.	Each	MR	3						
	c) Shock Treatment Chart duly glazed mounted on Aluminum Frame with Sheet Glass as required.	Each	MR	3						
	d) Supplying and laying of 36kV grade 1 metre wide anti skid chequered type rubber mat.	Metre	MR	5						
	e) Supplying and laying of 12kV grade 1 metre wide anti skid chequered type rubber mat.	Metre	MR	45						
	f) Supplying and laying of 1.1kV grade 1 metre wide anti skid chequered type rubber mat.	Metre	MR	20						
	f) Supply rubber hand gloves 33kV grade as per I.S. Code.	Set	MR	2						
	g) Supply rubber hand gloves 11kV grade as per I.S. Code.	Set	MR	6						
	h) Supplying of digital Earth Tester complete with probes etc as required	Set	MR	3						
	i) Supplying of Telescopic folding Aluminium ladder folding double with sitting stand 6 M etc as required	Each	MR	3						
1.19	Providing and fixing of M.S Slotted angle iron with fixing materials and painting for cable racks in trenches /on wall etc. as required	KG	MR	3000						
1.20	Providing and fixing of M.S Slotted angle 'C' channel /Ladder type rack /tray including fixing material grouted in wall or haning with M.S rod hanger from ceiling including 2 coat svnthetic enamel painting over 1 coat of res oxide primer etc. as required	KG	MR	2500						
1.21	Fabrication and Installing following size of preforted M.S Cable tray including Horizontal and vertical bends, reducers,tee, crossmember and other accessories as required and duly Suspended from the ceiling with M.S 12mm rod suspenders and including painting etc. as required.									
	i) 150mmwidth x 50mm depth x1.6mm thickness	Metre	MR	2200						
	ii) 300mmwidth x 50mm depth x1.6 mm thickness	Metre	MR	1700						
	iii) 450mmwidth x 62.5mm depth x2.0mm thickness	Metre	MR	1700						
	iv) 600mmwidth x 62.5mm depth x2.0mm thickness	Metre	MR	1500						
	v) 750 mmwidth x 75mm depth x2.0mm thickness	Metre	MR	400						
	vi) 900mmwidth x 75mm depth x2.0mm thickness	Metre	MR	400						
1.22	Fabrication and Installing following size of Ladder type M.S Cable tray including Horizontal and vertical bends, reducers,tee, crossmember and other accessories as required and duly Suspended from the ceiling with M.S 12mm rod suspenders and including painting etc. as required.									
	i) 450mmwidth x 62.5mm depth x2.0mm thickness	Metre	MR	1200						
	ii) 600mmwidth x 62.5mm depth x2.0mm thickness	Metre	MR	1000						
	iii) 750 mmwidth x 75mm depth x2.0mm thickness	Metre	MR	400						
	iv) 900mmwidth x 75mm depth x2.0mm thickness	Metre	MR	200						
	TOTAL SUBHEAD 1: H.T. SUB STATION as mentioned above									
	SUB HEAD 2: MAIN LT PANEL									
2.00	MAIN LT PANEL ESS-1(Hospital)									
2.01	Supply, installation, testing and commissioning of LT Panel. Type Tested Assembly (TTA) panel, IEC 61439 cubicle type, totally enclosed, free standing type, dust ,damp and vermin proof panel , powder coated, made up of CRCA sheet, complete with aluminum 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.Complete as per technical specifications and as required									
	Note :									
	i Automatic Change over of DG on LT Panel at the time of power failure and visa versa.									
	ii All ACBs shall have spare contacts & BMS Comptiable									
	iii All relays to operate at 240Volts, Single phase, 50Hz. AC supply through UPS. UPS of suitable Rating is also in the scope of Supply									
	iv Intellignet Panel Meter: Flush mounting, 96 x 96 mm size class 1 accuracy and LCD display. Panel meter should be suitable for true RMS reading. Meter should measure line and phase voltage, current of all 3 phases and neutral, HZ, PF, KW, KWH, KVAR, KVARH, KVA, KVAH, Voltage and current including one set of CT and Meter shall have RS 485 port for BMS connectivity or any other port for connection to BMS. Meter should be EMI/ EMC complaint.									
	v All ACBs shall have 65KA for 1 second.									
	vi All ACBs should have Ics=Icu=100%									
	vii All MCCBs shall have Ics=Icu=100%									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
a)	INCOMER:									
i)	6 No. ACB Panels each having following: 4000 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit , Instantaneous & Earth Fault trip including under voltage release and lockable trip push button. ACB should have Icw=Ics=Icu=65KA for 1 sec. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to Close the ACB. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Intelligent Panel Meter as mentioned above with one set of CTs One set of dual core dual ratio CT of 4000/2000/5/5A for capacitor panel. CT suitable for AHF -Class of accuracy should be 0.5, Burden 15VA ,secondary ratio 4000 /1 Amp ,(Active Harmonic Filter)									
b)	BUSBARS: 4000 Amps TPN busbars of Copper with temperture rise of 40 ° C over and above Ambient temperture of 45 Degree Celsius.65kA for 1 sec									
c)	BUS COUPLER:									
i)	3 No. ACB Panels each having following: 4000 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit , Instantaneous & Earth Fault trip including and lockable trip push button. The ACB should have Icw=Ics=Icu=65 KA for 1 sec. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. 1 Set of Ammeter with ASS and CTs.									
d)	OUTGOING:									
i)	8 Nos. ACB Panels each having following: 3200 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Digital ammeter with selector switch with one set Suitable C.Ts.									
ii)	4 Nos. ACB Panels each having following: 2000 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Intelligent Panel Meter with one set of CTs									
iii)	6 Nos. ACB Panels each having following: 1250 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Intelligent Panel Meter with one set of CTs									
iv)	3 Nos. ACB Panels each having following: 1000 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Intelligent Panel Meter with one set of CTs									
v)	6 Nos. ACB Panels each having following: 800 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Intelligent Panel Meter with one set of CTs									
vi)	18 Nos. MCCB feeder as per following details/ specifications: 630 Amp, 415 volts, 65 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
vii)	3 Nos. MCCB feeder as per following details/ specifications:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	400 Amp, 415 volts, 65 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
viii)	6 Nos. MCCB feeder as per following details/ specifications: 250 Amp, 415 volts, 65 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
ix)	4 Nos. MCCB feeder as per following details/ specifications: 200 Amp, 415 volts, 65KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Digital ammeter with selector switch with one set Suitable C.Ts.									
x)	9 Nos. MCCB feeder as per following details/ specifications: 160 Amp, 415 volts, 65 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	Main LT Panel ESS-1 (Hospital) as mentioned above.	Set	MR	1						
2.02	Main LT Panel ESS-2(Academic) Supply, installation, testing and commissioning of LT Panel, Type Tested Assembly (TTA) panel, IEC 61439 cubicle type, totally enclosed, free standing type, dust, damp and vermin proof panel, powder coated, made up of CRCA sheet, complete with aluminum 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. Complete as per technical specifications and as required Note : i Automatic Change over of DG on LT Panel at the time of power failure and visa versa. ii All ACBs shall have spare contacts & BMS Compatible iii All relays to operate at 240Volts, Single phase, 50Hz., AC supply through UPS. UPS of suitable Rating is also in the scope of Supply iv Intelligent Panel Meter: Flush mounting, 96 x 96 mm size class 1 accuracy and LCD display. Panel meter should be suitable for true RMS reading. Meter should measure line and phase voltage, current of all 3 phases and neutral, HZ, PF, KW, KWH, KVAR, KVARH, KVA, KVAH, Voltage and current including one set of CT and Meter shall have RS 485 port for BMS connectivity or any other port for connection to BMS. Meter should be EMI/ EMC complaint. v All ACBs shall have 50KA for 1 second. vi All ACBs should have $I_{cw} = I_{cs} = I_{cu} = 100\%$ vii All MCCBs shall have $I_{cs} = I_{cu} = 100\%$ a) INCOMER: i) 2 No. ACB Panels each having following: 3200 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip including under voltage release and lockable trip push button. ACB should have $I_{cw} = I_{cs} = I_{cu} = 50KA$ for 1 sec. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to Close the ACB. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Intelligent Panel Meter as mentioned above with one set of CTs One set of dual core dual ratio CT of 2500/1250/5/5A for capacitor panel. ii) 1 No. ACB Panels each having following: 1250 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip including under voltage release and lockable trip push button. ACB should have $I_{cw} = I_{cs} = I_{cu} = 50KA$ for 1 sec.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to Close the ACB.									
	R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.									
	Intelligent Panel Meter as mentioned above with one set of CTs									
	One set of dual core dual ratio CT of 2500/1250/5/5A for capacitor panel.									
	b) BUSBARS:									
	3200 Amps TPN busbars of copper with temperature rise of 40 degree celsius over and above ambient temperature of 45 degree Celsius 50kA for 1 sec.									
	c) BUS COUPLER:									
	i) 1 No. ACB Panels each having following:									
	3200 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip including and lockable trip push button. The ACB should have Icw=Ics=Icu=50 KA for 1 sec.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to CLOSE the ACB.									
	Ammeter with selector switch									
	d) OUTGOING:									
	i) 1 Nos. ACB Panels each having following:									
	1250 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 50 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous, Earth fault trip and lockable trip push button.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to CLOSE the ACB.									
	Intelligent Panel Meter with one set of CTs									
	ii) 2 Nos. ACB Panels each having following:									
	1600 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 50 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous, Earth fault trip and lockable trip push button.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to CLOSE the ACB.									
	Intelligent Panel Meter with one set of CTs									
	iii) 1 Nos. MCCB feeder as per following details/ specifications:									
	800 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection.									
	Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.									
	Intelligent Panel Meter with one set of CTs									
	iv) 6 Nos. MCCB feeder as per following details/ specifications:									
	630 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection.									
	Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.									
	Intelligent Panel Meter with one set of CTs									
	v) 3 Nos. MCCB feeder as per following details/ specifications:									
	500 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection.									
	Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.									
	Intelligent Panel Meter with one set of CTs									
	vi) 3 Nos. MCCB feeder as per following details/ specifications:									
	400 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection.									
	Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.									
	Intelligent Panel Meter with one set of CTs									
	vii) 1 Nos. MCCB feeder as per following details/ specifications:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	320 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
viii)	5 Nos. MCCB feeder as per following details/ specifications: 250 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
ix)	4 Nos. MCCB feeder as per following details/ specifications: 200 Amp, 415 volts, 65KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Digital ammeter with selector switch with one set Suitable C.Ts.									
x)	5 Nos. MCCB feeder as per following details/ specifications: 100 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs Main LT Panel ESS-2 (Academic) as mentioned above.	Set	MR	1						
2.03	Main LT Panel ESS-3(Residential) Supply, installation, testing and commissioning of LT Panel, Type Tested Assembly (TTA) panel, IEC 61439 cubicle type, totally enclosed, free standing type, dust, damp and vermin proof panel, powder coated, made up of CRCA sheet, complete with aluminum 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. Complete as per technical specifications and as required Note : i Automatic Change over of DG on LT Panel at the time of power failure and visa versa. ii All ACBs shall have spare contacts & BMS Compatible iii All relays to operate at 240Volts, Single phase, 50Hz., AC supply through UPS. UPS of suitable Rating is also in the scope of Supply iv Intelligent Panel Meter: Flush mounting, 96 x 96 mm size class 1 accuracy and LCD display. Panel meter should be suitable for true RMS reading. Meter should measure line and phase voltage, current of all 3 phases and neutral, HZ, PF, KW, KWH, KVAR, KVARH, KVA, KVAH, Voltage and current including one set of CT and Meter shall have RS 485 port for BMS connectivity or any other port for connection to BMS. Meter should be EMI/ EMC compliant. v All ACBs shall have 50KA for 1 second. vi All ACBs should have Iew=Ics=Icu=100% vii All MCCBs shall have Ics=Icu=100%									
a)	INCOMER:									
i)	2 No. ACB Panels each having following: 1000 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip including under voltage release and lockable trip push button. ACB should have Iew=Ics=Icu=50KA for 1 sec. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to Close the ACB. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Intelligent Panel Meter as mentioned above with one set of CTs One set of dual core dual ratio CT of 2500/1250/5/5A for capacitor panel.									
b)	BUSBARS: 1000 Amps TPN busbars of copper with temperature rise of 40 degree celsius over and above ambient temperature of 45 degree Celsius 50kA for 1 sec.									
c)	BUS COUPLER:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	i) 1 No. ACB Panels each having following: 1000 A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit , Instantaneous & Earth Fault trip including and lockable trip push button. The ACB should have I _w =I _{cs} =50 KA for 1 sec. Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to CLOSE the ACB. Intelligent Panel Meter as mentioned above with one set of CTs									
	d) OUTGOING:									
	i) 2 Nos. MCCB feeder as per following details/ specifications: 630 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	ii) 2 Nos. MCCB feeder as per following details/ specifications: 500 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	ii) 5 Nos. MCCB feeder as per following details/ specifications: 250 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	iii) 2 Nos. MCCB feeder as per following details/ specifications: 200 Amp, 415 volts,50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	iv) 2 Nos. MCCB feeder as per following details/ specifications: 160 Amp, 415 volts,50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	v) 2 Nos. MCCB feeder as per following details/ specifications: 100 Amp, 415 volts,50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	Main LT Panel ESS-2 (Academic) as mentioned above.	Set	MR	1						
2.04	Main Emergency ESS-3(Residential) Supply, installation, testing and commissioning of Main Emergency, panel cubicle type, totally enclosed, free standing type, dust ,damp and vermin proof panel , powder coated, made up of CRCA sheet, complete with aluminum 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.Complete as per technical specifications and as required. Note : i Automatic Change over of DG on LT Panel at the time of power failure and visa versa. ii All ACBs shall have spare contacts & BMS Compatible iii All relays to operate at 240Volts, Single phase, 50Hz., AC supply through UPS. UPS of suitable Rating is also in the scope of Supply									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	iv Intelligenet Panel Meter: Flush mounting, 96 x 96 mm size class 1 accuracy and LCD display. Panel meter should be suitable for true RMS reading. Meter should measure line and phase voltage, current of all 3 phases and neutral, HZ, PF, KW, KWH, KVAR, KVARH, KVA, KVAH, Voltage and current including one set of CT and Meter shall have RS 485 port for BMS connectivity or any other port for connection to BMS. Meter should be EMI/ EMC compliant.									
	v All ACBs shall have 50KA for 1 second.									
	vi All ACBs should have Ics=Icu=100%									
	vii All MCCBs shall have Ics=Icu=100%									
	a) INCOMER:									
	i) 250 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	b) BUSBARS:									
	320 Amps TPN busbars of copper with temperture rise of 40 degree celsius over and above ambient temperture of 45 degree Celsius 50ka for 1 sec.									
	d) OUTGOING:									
	i) 8 Nos. MCCB feeder as per following details/ specifications:									
	100 Amp, 415 volts, 50 KA, Four Pole, Thermal Magnetic based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Intelligent Panel Meter with one set of CTs									
	Main Emergency Panel ESS-3(Residential) as mentioned above.	Set	MR	1						
2.05	CAPACITOR PANEL (1000 KVAR at 415V) ESS-1 (Hospital) Supply, installation, testing and commissioning of LV cubicle type totally enclosed free standing type, powder coated, dust, damp and vermin proof Capacitor Panel complete with busbars, MV danger notice plate, ammeter, ammeter selector switch, indicating lamps, CTs, heavy duty, MPP resin filled, type Capacitors suitable for non linear loads upto 15% with Copper wound 14% D-tunned filters with linearity should not be less than 143%, total operating losses of capacitor shall not more than 0.5 W/ KVAR. Contactors suitable for capacitor switching or Capacitor duty switching contactor with 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 per technical Specifications as required.									
	a) INCOMER:									
	2000 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 50 KA, FP, Air Circuit Breaker with microprocessor based overload, short circuit & Instantaneous Earth fault trip including lockable trip push button. Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Day & Night mode selector Switch. 14 steps Intelligent microprocessor based Automatic Power factor Correction relay having measurement sensitivity of 1 % or better. Extension of incoming busbars for connection of multicore armoured aluminium cables. ON/ OFF delay timers for switching capacitor circuit.									
	b) METERING:									
	1 set of Digital Amp. Meter, Digital Power factor meter and Digital voltmeter.									
	c) BUSBARS:									
	2000 Amps TP busbars of aluminum with temperture rise of 40 degree celsius over and above Ambient temperture of 45 degree celsius.									
	d) OUTGOINGS:									
	i) 9 Nos.100KVAr at 415V Delta connected step as per following details/ specification:									
	200 Amps, 415 volts, 50 KA TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to sypress switching inrush current and suitable for 100KVAr step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 100 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15%, & total operating losses not more than 0.5 W per KVAR.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	415Volts, 14% copper wound D-tuned reactor suitable for 50KVA step .This 50KVA further connect parallel (2x50KVA) to make physicaly 100KVA steps for effective heat dissipation.									
	ii) 2 Nos. 50Kvar at 415V Delta connected step as per following details/ specification: 100 Amps, 415 volts, and having O/L, S/C & inbuilt E/F protection. TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current and suitable for 50KVA step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 50 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15% & total operating losses not more than 0.5 W per KVAR. 415Volts, 14% copper wound D-tuned reactor suitable for 50KVA step.									
	CAPACITOR PANEL (1000 KVAR at 415V) ESS-1 (Hospital) AS MENTIONED ABOVE	Set	MR	4						
2.06	CAPACITOR PANEL (800 KVAR at 415V) ESS-2 (Academic) Supply, installation, testing and commissioning of LV cubicle type totally enclosed free standing type, powder coated, dust, damp and vermin proof Capacitor Panel complete with busbars, MV danger notice plate, ammeter, ammeter selector switch, indicating lamps, CTs, heavy duty, MPP resin filled, type Capacitors suitable for non linear loads upto 15% with Copper wound 14% D-tunned filters with linearity should not be less then 143%, total operating losses of capacitor shall not more than 0.5 W/ KVAR, Contactors suitable for capacitor switching or Capacitor duty switching contactor with 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 per technical Specifications as required.									
	a) INCOMER: 1600 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 50 KA, TP, Air Circuit Breaker with microprocessor based overload, short circuit & Instantaneous Earth fault trip including lockable trip push button. Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Day & Night mode selector Switch. 14 steps Intelligent microprocessor based Automatic Power factor Correction relay having measurement sensitivity of 1 % or better. Extension of incoming busbars for connection of multicore armoured aluminium cables. ON/ OFF delay timers for switching capacitor circuit.									
	b) METERING: 1 set of Digital Amp. Meter, Digital Power factor meter and Digital voltmeter.									
	c) BUSBARS: 1600 Amps TP busbars of aluminum with temperture rise of 40 degree celsius over and above Ambient temperture of 45 degree celsius.									
	d) OUTGOINGS:									
	i) 4 Nos.100KVA at 415V Delta connected step as per following details/ specification: 200 Amps, 415 volts, .50 KA TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current and suitable for 100KVA step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 100 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15%, & total operating losses not more than 0.5 W per KVAR. 415Volts, 14% copper wound D-tuned reactor suitable for 50KVA step .This 50KVA further connect parallel (2x50KVA) to make physicaly 100KVA steps for effective heat dissipation.									
	ii) 8 Nos. 50Kvar at 415V Delta connected step as per following details/ specification: 100 Amps, 415 volts, and having O/L, S/C & inbuilt E/F protection. TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to supress switching inrush current and suitable for 50KVA step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 50 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15% & total operating losses not more than 0.5 W per KVAR. 415Volts, 14% copper wound D-tuned reactor suitable for 50KVA step.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	CAPACITOR PANEL (800 KVAR at 415V) ESS-2 (Academic) AS MENTIONED ABOVE	Set	MR	2						
2.07	CAPACITOR PANEL (250 KVAR at 415V) ESS-3 Supply, installation, testing and commissioning of LV cubicle type totally enclosed free standing type, powder coated, dust, damp and vermin proof Capacitor Panel complete with busbars, MV danger notice plate, ammeter, ammeter selector switch, indicating lamps, CTs, heavy duty, MPP resin filled, type Capacitors suitable for non linear loads upto 15% with Copper wound 14% D-tuned filters with linearity should not be less than 143%, total operating losses of capacitor shall not more than 0.5 W/ KVAR, Contactors suitable for capacitor switching or Capacitor duty switching contactor with 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 per technical Specifications as required.									
a)	INCOMER: 1 Nos. MCCB feeder as per following details/ specifications: 500 Amp, 415 volts, 50 KA, Four Pole, Microprocessor release based MCCB with variable current settings and having O/L, S/C & inbuilt E/F protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Day & Night mode selector Switch. 14 steps Intelligent microprocessor based Automatic Power factor Correction relay having measurement sensitivity of 1 % or better. Extension of incoming busbars for connection of multicore armoured aluminium cables. ON/ OFF delay timers for switching capacitor circuit.									
b)	METERING: 1 set of Digital Amp. Meter, Digital Power factor meter and Digital voltmeter.									
c)	BUSBARS: 400 Amps TP busbars of aluminum with temperture rise of 40 degree celsius over and above Ambient temperture of 45 degree celsius.									
d)	OUTGOINGS:									
i)	2 Nos. 50Kvar at 415V Delta connected step as per following details/ specification: 100 Amps, 415 volts, and having O/L, S/C & inbuilt E/F protection. TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to sypress switching inrush current and suitable for 50KVAR step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 50 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15% & total operating losses not more than 0.5 W per KVAR. 415Volts, 14% copper wound D-tuned reactor suitable for 50KVAR step.									
ii)	6 Nos. 25Kvar at 415V Delta connected step as per following details/ specification: 63 Amps, 415 volts, and having O/L, S/C & inbuilt E/F protection. TP MCCB with Thermal Magnetic release having variable current settings. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 415 volts, TP Capacitor duty Contactor Suitable for capacitive switching including current limiting contactor circuit to sypress switching inrush current and suitable for 50KVAR step. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. 25 KVAR heavy duty MPP type resin filled capacitors suitable for non linear loads upto 15% & total operating losses not more than 0.5 W per KVAR. 415Volts, 14% copper wound D-tuned reactor suitable for 50KVAR step.									
	CAPACITOR PANEL (250 KVAR at 415V) ESS-3 AS MENTIONED ABOVE	Set	MR	2						
2.08	ACTIVE HARMONIC FILTER (AHF) 300Amps at 440V ESS-1 Supply, installation, testing ,supply and commissioning of LV cubicle type totally enclosed free standing type, powder coated, dust, damp and									
a)	INCOMER: 630A, 415 Volts, MCCB, 50 KA, Four Pole, with microprocessor based overload, short circuit & Instantaneous Earth fault trip Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP. R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs. Extension of incoming busbars for connection of multicore armoured aluminium cables. Sumation CT class .5, 4000+4000/1 ratio burden 15VA									
b)	METERING:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	1 set of Multifunction meter display Current, Power factor and Voltage.									
e)	BUSBARS: 630 Amps TPN busbars of aluminum with temperture rise of 40 degree celsius over and above Ambient temperture of 45 degree celsius.									
d)	OUTGOINGS:									
i)	4Nos.60 Amp at 440V IGBT based Module step as per following details/ specification: 60 Amp module with 12 IGBTs ,3 level topology . Internal fuse suitable for 60Amp module. "ON" and "OFF" LED indicating lamp ON Modules									
ii)	1Nos.60 Amp at 440V IGBT based Module step as per following details/ specification: Spare for 60 Amp module with 12 IGBTs ,3 level topology in future. AHF PANEL as mentioned above	Set	MR	4						
	TOTAL SUBHEAD 2: Main LT Panels as mentioned above.									
3.00	SUBHEAD 3 : DG SETS & ACCESSORIES									
3.01	SOUND PROOF DG SETS OF 1010 KVA									
	DG SET OF 1010 KVA :ESS-1 (Hospital) Supply, installation, testing and commissioning of sound proof (silent type) Diesel Generating set having 1010 KVA Prime Power Ratings , 415 volt at 1500 RPM, 0.8 power factor suitable for 50 Hz, 3 phase system , suitable bhp, Water Cooled Raditor type diesel engine- alternator set mounted on common base frame, return fuel cooler, battery & battery charger, Anti Vibration mounting pads, Engine alternator safeties, electronic governor including all accessories & their wiring as per technical specification. DG set should be PLC/PC compatible. including its foundation as per manufacturer recommendations This includes the following: - Supplying and fixing of suitable sizes Heavy class MS pipe for DG exhaust complete with bends, elbow, flanges etc including silencer and catalytic convertor exhaust pipe chimney 30 meter high or as per CPCB norms for exhaust of DG sets including foundation of chimney , fixing of LED Aviation light including its wiring , lighting arrestor including copper strips and earthing (2 strip per light aresstor and two earth pits with cooper plate earthing) etc. & supporting structure for each DG sestsas per pollution control board norms and as required. - Supply and fixing of 50mm thick compressed mineral wool insulation (Rock wool) for D.G. exhaust pipe with 24 gauge aluminium sheet cladding etc. as required for the under mentioned dia pipe. - Supply, installation, testing and commissioning of suitable size fuel pipe for connecting diesel engine to individual day service tank including supply and fixing of required valves & filters etc. as required. - Fabrication of supports for exhaust pipe, fuel pipe or for any other purpose out of suitable M.S. structural steel including supplying and applying of enamel paint of approved shade after one coat of steel primer of reputed company. - Supplying and fixing of suitable capacity cable adapter box for alternator. - Providing and fixing oil tank of 990 litres capacity complete with suitable M.S. fabricated MS stand oil level indicator gauge tank and stand duly painted, complete with float switches etc. as required. - Factory assembled Sound proof Canopy as per pollution control board requirement to achieve noise level desired during night condition, with base frame, doors, inspection window, fresh air supply fans etc - Any other item required for completion of system above (D.G. set).Complete as required in ready to use condition is in the scope of the contractor. DG SET OF 1010 KVA :ESS-1 (Hospital) as mentioned above.	Each	MR	4						
3.02	SYNCHRONISING-CUM-AMF PANEL (for 4 nos. DG Sets mentioned above)									
	Supply, installation, testing and commissioning of Synchronising Panel, M.V. cubicle type, totally enclosed, free standing type, powder coated , dust, damp and vermin proof indoor type Panel made up of CRCA sheet, complete with aluminium busbars, M.V. danger notice plate, interconnections with suitable capacity aluminum leads/solid aluminum strips/rods, and having incoming and outgoing switchgears as mentioned below and complete as required. Note : 1. All ACBs shall have Spare contacts 2. All relays to operate at 240Volts, Single phase, 50Hz. AC supply through UPS 3. Panel shall be suitable for manual synchronising & auto synchronising and automatic operation (AMF) for 2 nos. DG Sets and shall be complete with 1 no. operator control & software with PC									
A.	INCOMER :									
i)	4 Nos .ACB as per following details/ specification: 1600 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, three pole & neurtal contractor (if required) with suitable rating contactor Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
-	Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB									
-	Push button for CLOSE and TRIP with lock & key arrangement									
-	R, Y & B Phase indicating lamps (LED type) with 2A control SP MCBs									
-	Digital multi function meter with one set of suitable CTs, CT shorting links, R/Y/B LED indicating lamps and 2A cobntrol SP MCBs including RS 485 port for its Connectivity with BMS									
	ii) BUSBARS :									
-	3200 Amps TPN busbars of Copper with temperture rise of 40 ° C over and above Ambient temperture of 45 Degree Celsius.									
	B. OUTGOING :									
	i) 2 Nos .ACB Panel consisting of the following									
-	4000 A, 415 Volts, Fully Motorised, Fully Drawout type (EDO), 65 KA, Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous , Earth fault trip and lockable trip push button.									
-	Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
-	Push button to CLOSE the ACB.									
-	Digital multi function meter with one set of suitable CTs, CT shorting links, R/Y/B LED indicating lamps and 2A cobntrol SP MCBs, including RS 485 port for its Connectivity with BMS									
	C BUS COUPLER									
	i) 1 No .ACB Panel consisting of the following									
-	4000A, 415/500V, Fully Drawout type (EDO) (Breaking Capacity=65kA, Four Pole, Air Circuit Breaker without Release									
-	Indicating lamps with 2A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB									
-	Push button for CLOSE and TRIP with lock & key arrangement									
	D. SYNCHRONISING COMPONENTS :									
	Metering & Indication :									
-	Power and Energy Monitor									
-	Set running indicating lights : 230 volts AC-22mm dia									
-	Emergency stop push button 230 volts AC-22 mm dia									
-	Governor/AVR raise/lower joy stick									
-	8 window annunciation with hooter, test accept & reset push button									
-	Motorised potential AVR									
-	Time Totalizer									
	E. Auto Synchronizing,Auto Load Sharing with Auto Load Management facility with Cummins Engine Controller PCC3.3/Woodward make GCU /PLC control									
-	Voltage monitors for DG supply									
-	Voltage monitors for main supply									
-	Through Multifunction Meter with RS485 port									
-	Windows based operator interface graphics software									
-	CPU (Allen Bradley/Siemens/ABB/Schneider) with desk.									
-	EPROM (EP)									
-	PLC Rack etc. & any other item required for proper functioning of the system.									
-	Digital I / O modules as required with sufficient spare for future provision									
-	Analog I / O modules as required with sufficient spare for future provision									
-	PL to PLC communication card									
-	PL to PLC communication cable									
-	Power supply module									
-	Auto load sharing and management relay									
-	1kVA, Single phase input and single phase output, 240volts, 50 Hz., AC, Online UPS with inbuilt 15 minutes battery backup in form of sealed maintenance free batteries with power wiring to the control bus for power supply to relays. (To be installed inside the panel)									
-	Auxilliary relays for output command									
-	Set of Software for PLC in CD									
-	1 Set mimic (SEM)									
-	Set of control MCBs									
	F. DG PROTECTION AND AMF COMPONENTS;(IF PROTECTION ARE INBUILT IN ENGINE CONTROLLER/GCU,NOT REQUIRE ANY SEPARATE RELAY)									
-	Reverse power and Reactive power relay									
-	Over Voltage relay									
-	Under Voltage relay									
-	Over frequency relay									
-	Trip circuit supervision relay									
-	Master lockout relay									
-	Master trip/supervisory relay									
-	Battery charger (with trickle and boost charging).									
-	DC voltmeter and ammeter.									
-	DC ammeter.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	- 8 window Alarm annunciator with separate hooter, accept, reset and rest push button.									
	- Hooter.									
	- Engine Cranking Relay.									
	- Main supply voltage monitor, alternator voltmeter monitor and Engine Starting Relays.									
	- Auxillary relays, timer, push button and control fuses.									
	- Phase sequence relay									
	G. ENCLOSURE :									
	- Fabrication, PVC Sleeving, Control/Power Wiring and necessary hardware for complete synchronisation and load sharing									
	SYNCHRONISING-CUM-AMF PANEL (for 4 nos. DG Sets mentioned above)	Set	MR	1						
3.03	DG SETS OF 750KVA:ESS-2 (Academic) DG SET OF 750 KVA									
	Supply, installation, testing and commissioning of sound proof (silent type) Diesel Generating set having 750 KVA Prime Power Rating, 415 volt at 1500 RPM, 0.8 power factor suitable for 50 Hz, 3 phase system, suitable bhp, Water Cooled Radiator type diesel engine-alternator set mounted on common base frame, return fuel cooler, battery & battery charger, Anti Vibration mounting pads, Engine alternator safeties, electronic governor including all accessories, their wiring and control cable between DG set and panel etc. is also in the scope of supply, including its connections etc. complete as per technical specification. This includes the following:									
	- Supplying and fixing of suitable sizes Heavy class MS pipe for DG exhaust complete with bends, elbow, flanges etc including silencer and catalytic convertor exhaust pipe chimney as per CPCB norms for exhaust of DG sets.									
	- Supply and fixing of 50 mm thick compressed mineral wool insulation (Rock wool) for DG exhaust pipe with 24 gauge aluminium sheet cladding etc. as required for the under mentioned dia pipe.									
	- Supply, installation, testing and commissioning of suitable size fuel pipe for connecting diesel engine to individual day service tank including supply and fixing of required valves & filters etc. as required.									
	- Fabrication of supports for exhaust pipe, fuel pipe or for any other purpose out of suitable MS structural steel including supplying and applying of enamel paint of approved shade after one coat of steel primer of reputed company.									
	- Supplying and fixing of suitable capacity cable adapter box for alternator. (if required)									
	- Providing and fixing oil tank of 990 litres capacity complete with suitable MS fabricated MS stand, oil level indicator, gauge tank and stand duly painted, complete with float switches etc. as required.									
	- Supply of suitable hand manual pump with 20 Meter Hard PVC pipe for filling the Oil from drum in DG set									
	- First filling of Full capacity of Diesel in DG set after complete testing of DG set at site. For commissioning of DG set Diesel will provided by the contractor.									
	- Initial Supply as well as first replacement of lube oil, fuel for 8 hrs for full load test run would be provided by vendor before handing over DG Set to the Client.									
	- Factory assembled Sound proof Canopy as per pollution control board requirement to achieve noise level desired during night condition, with base frame, doors, inspection window, fresh air supply fans etc									
	- Any other item required for completion of system above (DG set).									
	A DG AMF PANEL (For the DG set as mentioned above)									
	Supply, installation, testing and commissioning of AMF Panel for above 750KVA DG Set, cubicle type, totally enclosed, free standing type, dust, damp and vermin proof Panel made up of 14/ 16 SWG CRCA sheet (load bearing members 14 SWG and doors 16 SWG), complete with aluminum busbars, MV danger notice plate, interconnections with suitable capacity aluminum leads/ solid aluminum strips/ rods, powder coated and having capacity to change over Main power and DG supply.									
	DG should start automatically and will have automatic change over at LT panel through auto change over arrangement of suitable capacity in the panel.									
	Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to CLOSE the ACB.									
	1 set of suitable set of CTs for measurement and protection.									
	R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.									
	1 set of Digital multi function meter with LCD display and measurement of parameters like voltages, currents, p.f, frequency, active and reactive power and energies etc.									
	B AMF panel should have following protection and AMF components for above mentioned DG set:									
	- Auto/ manual/ test/ off selector switch.									
	- 2 Nos over voltage relay, 2 nos. reverse power relay and 2 nos. under voltage relay.									
	- 3 sets of current transformers 5 P10 accuracy for protection, class-1 for metering and 15 VA burden.									
	- Energy analyzer unit to indicate current voltage frequency power factor and KWH.									
	- Indicating lamps for load on mains and load on set.									
	- Fuse for instruments.									
	- Battery charger complete with transformer/ rectifier, DC voltmeter and ammeter, selector switch for trickle, off and boost the current adjustment.									
	- Main supply failure monitor.									
	- Restoration timer.									
	- Control unit with three impulse automatic engine start/ stop and failure to start lockout.									
	- Impulse counter with locking and reset facility.									
	- On/ Off/ Control circuit switch with indicator.									
	- Audio/ Video annunciation for:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	i) High winding temperature.									
	ii) Low lubricating oil pressure									
	iii) Engine over speed									
	iv) Engine fails to start									
	v) Full load/ maximum load warning.									
	C ENCLOSURE:									
	Fabrication, PVC Sleeving, Control/ Power Wiring and necessary electrical/ mechanical interlocking etc. any other item required for proper functioning of the system complete as required.									
	DG SETS OF 750KVA:ESS-2 (Academic) WITH AMF PANEL as mentioned above	Set	MR	1						
3.04	DG SETS OF 100KVA: ESS-3 (Residential)									
	DG SET OF 100 KVA									
	Supply, installation, testing and commissioning of sound proof (silent type) Diesel Generating set having 100KVA Prime Power Rating, 415 volt at 1500 RPM, 0.8 power factor suitable for 50 Hz, 3 phase system, suitable bhp, Water Cooled Radiator type diesel engine-alternator set mounted on common base frame, return fuel cooler, battery & battery charger, Anti Vibration mounting pads, Engine alternator safeties, electronic governor including all accessories, their wiring and control cable between DG set and panel etc. is also in the scope of supply, including its connections etc. complete as per technical specification. This includes the following:									
	- Supplying and fixing of suitable sizes Heavy class MS pipe for DG exhaust complete with bends, elbow, flanges etc including silencer and catalytic convertor exhaust pipe chimney as per CPCB norms for exhaust of DG sets.									
	- Supply and fixing of 50 mm thick compressed mineral wool insulation (Rock wool) for DG exhaust pipe with 24 gauge aluminium sheet cladding etc. as required for the under mentioned dia pipe.									
	- Supply, installation, testing and commissioning of suitable size fuel pipe for connecting diesel engine to individual day service tank including supply and fixing of required valves & filters etc. as required.									
	- Fabrication of supports for exhaust pipe, fuel pipe or for any other purpose out of suitable MS structural steel including supplying and applying of enamel paint of approved shade after one coat of steel primer of reputed company.									
	- Supplying and fixing of suitable capacity cable adapter box for alternator. (if required)									
	- Providing and fixing oil tank of 990 litres capacity complete with suitable MS fabricated MS stand, oil level indicator, gauge tank and stand duly painted, complete with float switches etc. as required.									
	- Supply of suitable hand manual pump with 20 Meter Hard PVC pipe for filling the Oil from drum in DG set									
	- First filling of Full capacity of Diesel in DG set after complete testing of DG set at site. For commissioning of DG set Diesel will provided by the contractor.									
	- Initial Supply as well as first replacement of lube oil, fuel for 8 hrs for full load test run would be provided by vendor before handing over DG Set to the Client.									
	- Factory assembled Sound proof Canopy as per pollution control board requirement to achieve noise level desired during night condition, with base frame, doors, inspection window, fresh air supply fans etc									
	- Any other item required for completion of system above (DG set).									
	A DG AMF PANEL (For the DG set as mentioned above)									
	Supply, installation, testing and commissioning of AMF Panel for above 100KVA DG Set, cubicle type, totally enclosed, free standing type, dust, damp and vermin proof Panel made up of 14/ 16 SWG CRCA sheet (load bearing members 14 SWG and doors 16 SWG), complete with aluminum busbars, MV danger notice plate, interconnections with suitable capacity aluminum leads/ solid aluminum strips/ rods, powder coated and having capacity to change over Main power and DG supply.									
	DG should start automatically and will have automatic change over at LT panel through auto change over arrangement of suitable capacity in the panel.									
	Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.									
	Push button to CLOSE the ACB.									
	1 set of suitable set of CTs for measurement and protection.									
	R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.									
	1 set of Digital multi function meter with LCD display and measurement of parameters like voltages, currents, p.f, frequency, active and reactive power and energies etc.									
	B AMF panel should have following protection and AMF components for above mentioned DG set:									
	- Auto/ manual/ test/ off selector switch.									
	- 2 Nos over voltage relay, 2 nos. reverse power relay and 2 nos. under voltage relay.									
	- 3 sets of current transformers 5 P10 accuracy for protection, class-1 for metering and 15 VA burden.									
	- Energy analyzer unit to indicate current voltage frequency power factor and KWH.									
	- Indicating lamps for load on mains and load on set.									
	- Fuse for instruments.									
	- Battery charger complete with transformer/ rectifier, DC voltmeter and ammeter, selector switch for trickle, off and boost the current adjustment.									
	- Main supply failure monitor.									
	- Restoration timer.									
	- Control unit with three impulse automatic engine start/ stop and failure to start lockout.									
	- Impulse counter with locking and reset facility.									
	- On/ Off/ Control circuit switch with indicator.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	- Audio/ Video annunciation for:									
	i) High winding temperature.									
	ii) Low lubricating oil pressure									
	iii) Engine over speed									
	iv) Engine fails to start									
	v) Full load/ maximum load warning.									
	C ENCLOSURE:									
	Fabrication, PVC Sleaving, Control/ Power Wiring and necessary electrical/ mechanical interlocking etc. any other item required for proper functioning of the system complete as required.									
	DG SET WITH AMF PANEL as mentioned above	Set	MR	1						
3.05	SOUND PROOF DG SETS OF 20 KVA.									
	DG SET OF 20 KVA.(Director Banglow)									
	Supply, installation, testing and commissioning of sound proof (silent type) Diesel Generating set having 20 KVA Prime Power Ratings , 220 volt at 1500 RPM, 0.8 power factor suitable for 50 Hz, single phase system , suitable bhp, Water cooled Radiator type diesel engine-alternator set mounted on common base frame, return fuel cooler, battery & battery charger, Anti Vibration mounting pads, Engine alternator safeties, electronic governor including all accessories, their wiring and control cable between DG set and panel etc. is also in the scope of supply, including its connections etc. complete as per technical specification. DG set should be PLC/PC compatible. This includes the following:									
	- Supplying and fixing of suitable sizes Heavy class MS pipe for DG exhaust complete with bends, elbow, flanges etc including silencer and catalytic convertor exhaust pipe chimney as per CPCB norms for exhaust of DG set.									
	- Supply and fixing of 50mm thick compressed mineral wool insulation (Rock wool) for D.G. exhaust pipe with 24 gauge aluminium sheet cladding etc. as required for the under mentioned dia pipe.									
	- Supply, installation, testing and commissioning of suitable size fuel pipe for connecting diesel engine to individual day service tank including supply and fixing of required valves & filters etc. as required.									
	- Fabrication of supports for exhaust pipe, fuel pipe or for any other purpose out of suitable M.S. structural steel including supplying and applying of enamel paint of approved shade after one coat of steel primer of reputed company.									
	- Supplying and fixing of suitable capacity cable adapter box for alternator.									
	- Providing and fixing oil tank of suitable capacity complete with suitable M.S. fabricated MS stand oil level indicator gauge tank and stand duly painted, complete with float switches etc. as required.									
	- Factory assembled Sound proof Canopy as per pollution control board requirement to achieve noise level desired during night condition, with base frame, doors, inspection window, fresh air supply fans etc									
	- Any other item required for completion of system above (D.G. set).									
	A. DG AMF PANEL									
	Supply, installation, testing and commissioning of AMF Panel for above 20 KVA DG Set cubicle type, totally enclosed, free standing type, dust, damp and vermin proof Panel made up of 14/ 16SWG CRCA sheet, (load bearing members 14 SWG and doors 16 SWG) ,complete with aluminum busbars, M.V. danger notice plate, interconnections with suitable capacity aluminum leads/solid aluminum strips/rods, powder coated and having capacity to change over Main power and DG supply .									
	DG should start automatically and will have automatic change over at LT panel through auto change over arrangement of suitable capacity in the panel.									
	Indicating lamps with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB									
	Push button to CLOSE the ACB.									
	1 set of suitable set of CT for measurement and protection.									
	R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs									
	1 set of Digital multi function meter with LCD display and measurement of parameters like voltages, currents, p.f, frequency, active and reactive power and energies etc									
	B. AMF panel should have following protection and AMF components for above mentioned DG set.									
	- Auto/manual/test/off selector switch									
	- 2 Nos over voltage relay, 2 nos. reverse power relay and 2 nos. under voltage relay.									
	- 3 sets of current transformers 15 P 10 accuracy for protection and 15 VA class -1 for metering									
	- Energy analyzer unit to indicate current voltage frequency power factor and KWH									
	- Indicating lamps for load on mains and load on set.									
	- Fuse for instruments.									
	- Battery charger, complete with transformer/rectifier, DC voltmeter and ammeter, selector switch for trickle, off and boost the current adjustment.									
	- Main supply failure monitor.									
	- Restoration timer.									
	- Control unit with three impulse automatic engine start / stop and failure to start lockout.									
	- Impulse counter with locking and reset facility.									
	- On/Off/ Control circuit switch with indicator.									
	- Audio/ Video annunciation for :									
	a) High winding temperature.									
	b) Low lubricating oil pressure									
	c) Engine over speed									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	d) Engine fails to start									
	e) Full load/ maximum load warning.									
	C. ENCLOSURE :									
	Fabrication, PVC Sleeving, Control/Power Wiring and necessary electrical/ mechanical interlocking etc any other item required for proper functioning of the system complete as required.									
	DG SET WITH AMF Panel as mentioned above	Set	MR	1						
3.06	Under Ground Diesel Tank									
	Design, supply, installation, testing & commissioning of 20 KL underground MS diesel tank including all related civil works foundation, fencing, platform, for unloading of diesel . Flame proof push buttons, pumps (one working & one standby) for supplying of diesel from this UG tank to day tanks of all the DG sets complete with cabling, earthing, piping, float switches etc.Extinguishers shall be as per fire norms. including all necessary approvals from chief controller of explosives.	Set	MR	1						
3.07	Axiliary Panel									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	250 Amp 415 volts, 35 KA, Motorised, FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Separate fault indication for O/L, S/C, & E/F to be provided on Panel Door.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 16 Sets of following									
	40 Amps, 415 volts, 9 KA , Four Pole, Miniature Circuit Breaker (D-type suitable for motors)									
	3 Phase, fully Automatic DOL starter Suitable for 5-7.5 HP with thermal overload relay with inbuilt single phase preventor, contactor, Push Buttons and Switches etc complete as required.									
	LED indicating Lamps for "ON", "OFF" & "TRIP".									
	ii) 8 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	iii) 8 no. 40 Amps, 220 volts, 9 KA, Double Pole, Miniature Circuit Breaker.									
	Auxiliary Panel as mentioned above	Set	MR	1						
	TOTAL SUBHEAD 3: DG SETS AS MENTIONED ABOVE									
	SUBHEAD 4: RISING MAINS									
4.00	RISING MAINS									
4.01	Supply, installation, testing and commissioning of plug in type , indoor sandwich type with high conductivity Aluminium Conductor , 415 V,3 phase, 4 wire, vertical Aluminium Rising main Class B or better in following sizes including bends, flexible, provision of the tap off's as per requirement , Adoptor boxes for cable connection if required are inclusive, 2 nos of aluminium earthing strips 50 X 6mm through out the length of the rising mains, end cover, including all types of support and necessary hardware for installation of the rising main etc. complete as per specifications and as required. (Exact lengths to be measured at site).									
	i) 400 A , 415 volts	Metre	MR	105						
	ii) 630 A , 415 volts	Metre	MR	105						
	iii) 800 A , 415 volts	Metre	MR	140						
	iv) 1000 A, 415 volts	Metre	MR	70						
	v) 1250 A, 415 volts	Metre	MR	70						
4.02	Supply, fixing, testing and commissioning of Direct End Feed Unit of following ratings, wall mounted, dust, damp and vermin proof complete with M.V. danger notice plate, interconnections with suitable capacity aluminium strips / bars, connection of incoming cables with thimbles, powder coat painted and having following incoming switchgears for rising main complete as required.									
	i) 1 No. MCCB Panels each having following									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	1 no. 400 Amps, 415 volts, four pole, Moulded Case Circuit Breaker with microprocessor based release with variable current settings and having O/L, S/C & inbuilt E/F protection . Separate fault indication for O/L, S/C, & E/F to be provided on Panel Door. Indicating lamps with 6 A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V digital voltmeter with selector switch. 1 No. 0 to 400 Amp digital ammeter with selector switch with 400/5A C.T.'s.	Set	MR	3						
	ii) 1 No. MCCB Panels each having following									
	1 no. 630 Amps, 415 volts, four pole, Moulded Case Circuit Breaker with microprocessor based release with variable current settings and having O/L, S/C & inbuilt E/F protection . Separate fault indication for O/L, S/C, & E/F to be provided on Panel Door. Indicating lamps with 6 A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V digital voltmeter with selector switch. 1 No. 0 to 630 Amp digital ammeter with selector switch with 630/5A C.T.'s.	Set	MR	4						
	iii) 1 No. MCCB Panels each having following									
	1 no. 800 Amps, 415 volts, four pole, Moulded Case Circuit Breaker with microprocessor based release with variable current settings and having O/L, S/C & inbuilt E/F protection . Separate fault indication for O/L, S/C, & E/F to be provided on Panel Door. Indicating lamps with 6 A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V digital voltmeter with selector switch. 1 No. 0 to 630 Amp digital ammeter with selector switch with 800/5A C.T.'s.	Set	MR	3						
	v) 1 No. ACB Panels each having following									
	1000A 415V, 4P 50 kA EDO ACB with Microprocessor based release having Overload , Short circuit and Earth fault Protection. ON /OFF/TRIP Indications with MCB. 1 No. digital voltmeter with selector switch. 1 No Digital ammeter with selector switch and 1600/5A CTs.	Set	MR	2						
	vi) 1 No. ACB Panels each having following									
	1250A 415V, 4P 50 kA EDO ACB with Microprocessor based release having Overload , Short circuit and Earth fault Protection. ON /OFF/TRIP Indications with MCB. 1 No. digital voltmeter with selector switch. 1 No Digital ammeter with selector switch and 1600/5A CTs.	Set	MR	2						
4.03	Supply, fixing, testing and commissioning of distribution tap off box of following Capacity on the existing rising mains complete with Four Pole, Moulded Case Circuit Breaker,(upto 200A Thermal Magnetic and 250A and above uP Based) interconnection, earthing etc. complete as required.									
	i) 63 Amps with MCCB 50 KA	Nos	MR	1						
	ii) 100 Amps with MCCB 50 KA	Nos	MR	14						
	iii) 125 Amps with MCCB 50 KA	Nos	MR	12						
	iv) 160 Amps with MCCB 50 KA	Nos	MR	1						
	v) 200 Amps with MCCB 50 KA	Nos	MR	9						
	vi) 250 Amps with MCCB 50 KA	Nos	MR	12						
	vii) 320 Amps with MCCB 50 KA	Nos	MR	2						
	viii) 400 Amps with MCCB 50 KA	Nos	MR	8						
	ix) 630 Amps with MCCB 50 KA	Nos	MR	7						
	TOTAL SUBHEAD 4: RISING MAINS AS MENTIONED ABOVE									
	SUB HEAD 5: MV PANELS									
5.00	MV PANELS									
	Supply, installation, testing and commissioning of following M.V. cubicle type totally enclosed, wall mounted/free standing type, powder coated, dust, damp and vermin proof, indoor type Distribution Board/Panel complete with busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, and having following incoming and outgoing switchgears complete as per technical specification and as required.									
	NOTE									
	i All MCCBs shall have Ics=Icu.									
	ii MCB Should be connected through terminal Strip of suitable rating									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	HOSPITAL									
5.01	MV PANEL {POWER (SECTION-1,&2) BASEMENT}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	FLOOR MV PANEL { POWER (SECTION-1, & 2) BASMENT} as mentioned above	Set	MR	2						
5.02	MV PANEL {POWER (SECTION-1{ Ground , First, Third, Fourth,Fifth & Sixth}& Section 2 (First Floor)}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	630 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	800 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 20 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL {{POWER (SECTION-1{ Ground , First, Third, Fourth,Fifth & Sixth}& Section 2 (First Floor)} as mentioned above	Set	MR	7						
5.03	MV PANEL {POWER (SECTION-1{ Second Floor }& Section 2 (Second Floor)}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 10 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL {POWER (SECTION-1{ Second Floor }& Section 2 (Second Floor)} as mentioned above	Set	MR	2						
5.04	MV PANEL {POWER (SECTION-2{ Ground , Third, Fourth,Fifth & Sixth}}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	400 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	500 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 14 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL {POWER (SECTION-2{ Ground , Third, Fourth,Fifth & Sixth})} as mentioned above	Set	MR	5						
5.05	MV PANEL { LIGHT (SECTION-1,&2) BASEMENT}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	100 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6 no. 40 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL { POWER (SECTION-1.& 2) BASMENT} as mentioned above	Set	MR	2						
5.06	MV PANEL {LIGHT (SECTION-1{Ground, First & Third Floor}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 16 no. 40 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL {LIGHT (SECTION-1{Ground, First & Third Floor} as mentioned above	Set	MR	3						
5.07	MV PANEL {LIGHT(SECTION-1{ Second , Fourth,Fifth & Sixth}& Section 2 (Ground ,First Second ,Third, Fourth,Fifth & SixthFloor)}									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	125 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter.									
	Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 12 no. 40 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	MV PANEL {LIGHT(SECTION-1{ Second , Fourth,Fifth & Sixth}& Section 2 (Ground ,First Second ,Third, Fourth,Fifth & Sixth Floor})as mentioned above	Set	MR	11						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
5.08	LIFT Panel (Section -1 & 2)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 200 Amp 415 volts, .35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter. Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 8 Nos. MCCB as per following details/ specifications: 63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release and E/ F Module. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's.									
	ii) 4 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker. Lift Panel as mentioned above	Set	MR	2						
5.09	Computer Panel (Section -1 & Section)- Basement									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter. Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS: 400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	ii) 11 Nos. MCCB as per following details/ specifications: 63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release and E/ F Module. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's.									
	ii) 4 no. 32 Amps, 250 volts, 9 KA, Double Pole Miniature Circuit Breaker. Computer Panel (Section -1 & Section)- Basement as mentioned above	Set	MR	2						
5.10	Sub Computer Panel Section -1 & 2 (Ground , First , Second, Third , Fourth , Fifth & Sixth Floor)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter. Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	ii) 8 no. 32 Amps, 250 volts, 9 KA, Double Pole Miniature Circuit Breaker.									
	Sub Computer Panel , as mentioned above	Set	MR	14						
5.11	UPS Lighting Panel (Section -1 & Section -2)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	100 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter.									
	Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	ii) 12 no. 32 Amps, 250 volts, 9 KA, Double Pole Miniature Circuit Breaker.									
	Inverter Panel as mentioned above	Set	MR	2						
5.12	A UPS INPUT PANEL (OTs & ICU)									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	500 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter.									
	Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS:									
	630 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	500 Amp 415 volts, 35 KA TP+NL MCCB MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's.									
	ii) 3 Nos. MCCB as per following details/ specifications:									
	160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's.									
	UPS INPUT PANEL as mentioned above	Set	MR	2						
5.13	B UPS OUTGOING Panel									
	a) INCOMER:									
	i) 3 No. MCCB Panels each having following									
	160 Amp 415 volts, 35 KA FP MCCB with thermal magnetic based release having variable current settings of O/L, S/C and E/ F Module.									
	Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter									
	Digital ammeter with one set Suitable C.Ts.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	b) BUSBARS: 500 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1 Nos. MCCB as per following details/ specifications: 500 Amp 415 volts, 35 KA TP+N MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's. UPS OUTGOING Panel as mentioned above	Set	MR	2						
5.14	LOAD OT & ICU Panel									
	a) INCOMER:									
	i) 2 Nos. MCCB as per following details/ specifications: 500 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. Mechanical interlock with each other Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter. Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS: 630 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 20 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker. Load Panel as mentioned above	Set	MR	2						
5.15	A EQUIPMENT PANEL									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following 800 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. Phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter. Digital ammeter with one set Suitable C.Ts.									
	b) BUSBARS: 1000 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 3 Nos. MCCB as per following details/ specifications: 400 Amp 415 volts, 35 KA TP+NL MCCB MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's.									
	ii) 1 Nos. MCCB as per following details/ specifications: 250 Amp 415 volts, 35 KA TP+NL MCCB MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's.									
	iii) 3 Nos. MCCB as per following details/ specifications: 200 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release and E/ F Module.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's.									
	EQUIPMENT PANEL as mentioned above	Set	MR	1						
	Medical College Lab									
5.16	Main MV Panel Normal									
	a) INCOMER:									
	1250 Amp 415 volts, 50 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	1400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 3 Nos. MCCB as per following details/ specifications:									
	800 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 1Nos. MCCB as per following details/ specifications:									
	400 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 1 Nos. MCCB as per following details/ specifications:									
	200 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iv) 2 Nos. MCCB as per following details/ specifications:									
	63 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	Main MV Panel Normal as mentioned Above	Set	MR	1						
5.17	Main MV Panel Emergency									
	a) INCOMER:									
	630 Amp 415 volts, 50 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	800 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 3 Nos. MCCB as per following details/ specifications:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	400 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	3 Nos. MCCB as per following details/ specifications: (AHU)									
	250 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
iii)	2 Nos. MCCB as per following details/ specifications:									
	125 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
iv)	2 Nos. MCCB as per following details/ specifications:									
	100 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
v)	2 Nos. MCCB as per following details/ specifications:									
	63 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	Main MV Panel Emergency as mentioned Above	Set	MR	1						
5.18	MV Panel Normal section-1(Ground, 1st, 2nd & 3rd floor)									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following									
	200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS:									
	300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	10 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV Panel-section-1(Ground, 1st, 2nd & 3rd floor) as mentioned above	Set	MR	4						
5.19	MV PANEL Normal Section -1 (4th, 5th and 6th floor)									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following									
	400 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS:									
	500 Amp TPN Aluminium busbars									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	e) OUTGOING:									
	i) 16 no. 63 Amps, 415 volts, 9 KA, Four Pole Miniature Circuit Breaker.									
	MV PANEL Section -1 (4th, 5th and 6th floor) as mentioned above	Set	MR	3						
5.20	MV Panel Normal Section-2 (Ground,1st,2nd,3rd,4th,5th&6th floor)									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 10 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	MV Panel Normal Section-2 (Ground,1st,2nd,3rd,4th,5th&6th floor) as mentioned above	Set	MR	7						
5.21	MV Panel Emergency Section-1&Section-2 (Ground,1st,2nd,3rd,4th,5th&6th floor)									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	100 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 10 no. 40 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	MV Panel Emergency Section-1&Section-2 (Ground,1st,2nd,3rd,4th,5th&6th floor) as mentioned above	Set	MR	14						
5.22	Main Computer Panel Secion-1 & Section -2									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	125 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 7 Nos. MCCB as per following details/ specifications:									
	63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 6 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker.									
	Main Computer Panel Secion-1 & Section -2) as mentioned above	Set	MR	2						
5.23	Sub Computer Panel Secion-1 & Section -2 (1st,2nd,3rd,4th,5th&6th floor)									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker.									
	Sub Computer Panel Secion-1 & Section -2 (1st,2nd,3rd,4th,5th&6th floor) as mentioned above	Set	MR	12						
5.24	Lift Panel									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	100 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 3 Nos. MCCB as per following details/ specifications:									
	63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 4 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker.									
	Lift Panel as mentioned above	Set	MR	1						
	Medical College									
5.25	Main MV Panel Normal									
	a) INCOMER:									
	630 Amp 415 volts, 50 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	800 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	250 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 8 Nos. MCCB as per following details/ specifications:									
	125 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	iii) 4 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	Main MV Panel Normal as mentioned above	Set	MR	1						
5.26	Main MV Panel Emergency									
	a) INCOMER:									
	320 Amp 415 volts, 50 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	500 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	250 Amp 415 volts, 35 KA TP+NL MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt 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.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2 Nos. MCCB as per following details/ specifications:									
	125 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 2 Nos. MCCB as per following details/ specifications:									
	100 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iv) 8 Nos. MCCB as per following details/ specifications:									
	63 Amp 415 volts, 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	v) 4 no. 40 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	Main MV Panel Emergency as mentioned above	Set	MR	1						
5.27	MV Panel Normal (1st,2nd,3rd &4th floor)									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following									
	125 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	j) 6 no. 63 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	MV Panel Normal (1st,2nd,3rd &4th floor) as mentioned above	Set	MR	4						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
5.28	MV Panel Emergency (1st,2nd,3rd &4th floor)									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	6 no. 40 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker. MV Panel Normal (Ground floor, 1st,2nd,3rd &4th floor) as mentioned above	Set	MR	5						
5.29	Main Computer Panel									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following 125 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	5 Nos. MCCB as per following details/ specifications: 63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	5 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker. Main Computer Panel as mentioned above	Set	MR	1						
5.30	Sub Computer Panel (1st,2nd,3rd&4th floor)									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	5 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker. Sub Computer Panel (1st,2nd,3rd&4th floor) as mentioned above	Set	MR	4						
5.31	Lift Panel									
a)	INCOMER:									
i)	1 No. MCCB Panels each having following 100 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type).									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 3 Nos. MCCB as per following details/ specifications:									
	63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2 no. 40 Amps, 415 volts, 9 KA, Four Pole, Miniature Circuit Breaker.									
	Lift Panel as mentioned above	Set	MR	1						
	Library Block									
5.32	Main MV Panel Normal Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	400 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	500 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 4 Nos. MCCB as per following details/ specifications:									
	100Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2 Nos. MCCB as per following details/ specifications:									
	63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	vi) 4 no. 63 Amps, Four Pole Miniature Circuit Breaker.									
	Main MV Panel Ground Floor as mentioned above	Set	MR	1						
5.33	Main MV Panel Emergency Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 2 Nos. MCCB as per following details/ specifications: for AHU									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2 Nos. MCCB as per following details/ specifications: 100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 6 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iv) 4 no. 40 Amps Four Pole Miniature Circuit Breaker. Main MV Panel Emergency Ground Floor as mentioned above	Set	MR	1						
5.34	MV Panel Normal (First Floor and Second Floor)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 100Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6no. 63 Amps,Four Pole Miniature Circuit Breaker. MV Panel First Floor and Second floor as mentioned above	Set	MR	2						
5.35	MV Panel Emergency (First Floor and Second Floor)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 63Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6no. 40 Amps,Four Pole Miniature Circuit Breaker. MV Panel First Floor and Second floor as mentioned above	Set	MR	2						
5.36	Computer Panel									
	a) INCOMER:									
	i) 1 No. MCCB Panels each having following 100Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection and E/ F Module. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication (LED type). Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	j) 10 no. 40 Amps, 415 volts, 9 KA, Double Pole, Miniature Circuit Breaker.									
	Main Computer Panel as mentioned above	Set	MR	1						
	Resident Hostel									
5.37	Main MV Panel Normal Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 630 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 800 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	j) 1Nos. MCCB as per following details/ specifications: 160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2Nos. MCCB as per following details/ specifications: 125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 20 no. 63 Amps, Four Pole Miniature Circuit Breaker.									
	iv) 20 no. 40 Amps, Four Pole Miniature Circuit Breaker.									
	Main MV Panel Normal Ground Floor as mentioned above	Set	MR	1						
5.38	Main MV Panel Emergency Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	ii) 4 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 25 no. 40 Amps Four Pole Miniature Circuit Breaker.									
	Main MV Panel Emergency Ground Floor as mentioned above	Set	MR	1						
	Intern Hostel									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
5.39	Main MV Panel Normal Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 500 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 630 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	1Nos. MCCB as per following details/ specifications: 160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	2Nos. MCCB as per following details/ specifications: 125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
iii)	25 no. 63 Amps, Four Pole Miniature Circuit Breaker.									
	Main MV Panel Normal Ground Floor as mentioned above	Set	MR	1						
5.40	Main MV Panel Emergency Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 400 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	4 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	25 no. 40 Amps Four Pole Miniature Circuit Breaker.									
	Main MV Panel Emergency Ground Floor as mentioned above	Set	MR	1						
	UG Boys Hostel									
5.41	Main MV Panel Normal Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 400 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	b) BUSBARS: 630 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1Nos. MCCB as per following details/ specifications: 160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 2Nos. MCCB as per following details/ specifications: 125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	iii) 15 no. 63 Amps,Four Pole Miniature Circuit Breaker.									
	iv) 15 no. 40 Amps,Four Pole Miniature Circuit Breaker.									
	Main MV Panel Normal Ground Floor as mentioned above	Set	MR	1						
5.42	Main MV Panel Emergency Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 200 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 4 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 15 no. 40 Amps Four Pole Miniature Circuit Breaker.									
	Main MV Panel Emergency Ground Floor as mentioned above	Set	MR	1						
	UG Girls Hostel									
5.43	Main MV Panel Normal Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 500 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 630 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1Nos. MCCB as per following details/ specifications: 160 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type).									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	2Nos. MCCB as per following details/ specifications: 125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
iii)	20 no. 63 Amps, Four Pole Miniature Circuit Breaker.									
iv)	20 no. 40 Amps, Four Pole Miniature Circuit Breaker.									
	Main MV Panel Normal Ground Floor as mentioned above	Set	MR	1						
5.44	Main MV Panel Emergency Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 200 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	4 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	20 no. 40 Amps Four Pole Miniature Circuit Breaker. Main MV Panel Emergency Ground Floor as mentioned above	Set	MR	1						
	Amenity Block-1 &2									
5.45	MV Panel Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 100 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS: 300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
i)	2 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
ii)	5 no. 63 Amps Four Pole Miniature Circuit Breaker. MV Panel Ground Floor as mentioned above	Set	MR	2						
	Admin Block									
4.46	MV Panel Ground Floor									
a)	INCOMER:									
i)	1 Nos. MCCB as per following details/ specifications: 100 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 2 Nos. MCCB as per following details/ specifications: 63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 8 no. 63 Amps Four Pole Miniature Circuit Breaker.									
	MV Panel Ground Floor as mentioned above	Set	MR	1						
5.47	Computer Power Panel Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 63 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 8 no. 40 Amps Double Pole Miniature Circuit Breaker.									
	MV Panel Ground Floor as mentioned above	Set	MR	1						
	Residential Blocks									
5.48	MV Panel Normal Ground Floor (Type-II)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 160 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1Nos. MCCB as per following details/ specifications: 125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 5 Nos. MCCB as per following details/ specifications: 100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	MV Panel Normal Ground Floor (Type-III) as mentioned above	Set	MR	1						
5.49	MV Panel Normal Ground Floor (Type-III)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	200 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 1Nos. MCCB as per following details/ specifications:									
	125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 5 Nos. MCCB as per following details/ specifications:									
	100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	MV Panel Normal Ground Floor (Type-III) as mentioned above	Set	MR	1						
5.50	MV Panel Normal Ground Floor (Type-IV,Type-V)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									
	250 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS:									
	400 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 2Nos. MCCB as per following details/ specifications:									
	125 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	ii) 8 Nos. MCCB as per following details/ specifications:									
	100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
	MV Panel Normal Ground Floor (Type-IV,Type-V) as mentioned above	Set	MR	2						
5.51	MV Panel Emergency Ground Floor (Type-II,Type-III,Type-IV,Type-V)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	100 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 5 Nos. MCCB as per following details/ specifications: 63 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. ON, OFF, TRIP indication (LED Type). Digital Ampere Metre of suitable range with suitable set of CT's and ASS. 4 no. 40 Amps Four Pole Miniature Circuit Breaker.									
	ii) MV Panel Emergency Ground Floor (Type-II,Type-III,Type-IV,Type-V) as mentioned above	Set	MR	4						
5.52	Floor Metering Panel (Type-II,Type-III)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 6Nos. 63A FP MCB, with Dual source KWH meter, Class-1 accuracy, (Direct reading type without CT's) 0-80A, 3 Phase, 4 Wire with auto cut-off, With pre-paid facility / Post paid facility with room unit and complete with internal HR FRLS PVC Insulated unsheathed flexible copper conductor wiring of adequate size and input & output wiring terminal blocks as required. Floor Metering Panel (Type-II,Type-III) as mentioned above	Set	MR	6						
5.53	Floor Metering Panel (Type-IV,Type-V)									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications: 100 Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.									
	b) BUSBARS: 300 Amp TPN Aluminium busbars									
	c) OUTGOING:									
	i) 4Nos. 63A FP MCB, with Dual source KWH meter, Class-1 accuracy, (Direct reading type without CT's) 0-80A, 3 Phase, 4 Wire with auto cut-off, With pre-paid facility / Post paid facility with room unit and complete with internal HR FRLS PVC Insulated unsheathed flexible copper conductor wiring of adequate size and input & output wiring terminal blocks as required. Floor Metering Panel (Type-II,Type-III) as mentioned above	Set	MR	10						
	Director Bungalow									
5.54	MV Panel Ground Floor									
	a) INCOMER:									
	i) 1 Nos. MCCB as per following details/ specifications:									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	100 Amp 415 volts, 35 KA FP MCCB with microprocessor based release having variable current settings of O/L, S/C & inbuilt E/F protection release.									
	R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.									
	Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.									
	1 No. 0 to 500 V Digital voltmeter with selector switch.									
	Digital ammeter with selector switch with one set Suitable C.Ts.									
b)	BUSBARS:									
	300 Amp TPN Aluminium busbars									
c)	OUTGOING:									
iv)	1 Nos. MCCB as per following details/ specifications:									
	63Amp 35 KA TP+NL MCCB with thermal magnetic release having variable current settings of O/L, S/C protection release.									
	Extended rotary operating mechanism with door interlock with defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.									
	ON, OFF, TRIP indication (LED Type).									
	Digital Ampere Metre of suitable range with suitable set of CT's and ASS.									
v)	6 no. 63 Amps Four Pole Miniature Circuit Breaker.									
	MV Panel Ground Floor as mentioned above	Set	MR	1						
	TOTAL SUB HEAD 5: MV PANEL AS MENTIONED ABOVE									
	SUB HEAD 6: MCB DISTRIBUTION BOARDS.									
6.00	MCB DISTRIBUTION BOARD									
6.01	Supplying & fixing following way, three pole and neutral sheet steel, MCB distribution board, 415 volts, on recess/surface complete with loose wire box, terminal blocks, tinned copper busbar, neutral link, earth bar, din bar, detachable gland plate, interconnections, phosphatized and powder coated including earthing connection bolt etc. as per technical specifications and as required.(but without MCB & RCCB).									
i	4 way (8+12), Double door	Each	MR	226						
ii	6 way (8+18) Double door	Each	MR	209						
iii	8 way (8+24), Double door	Each	MR	304						
6.04	Supplying & fixing following rating, four pole, 415 volts, Miniature Circuit Breaker (MCB), in the existing MCB DB complete with connections, testing & commissioning etc. as per technical specifications and as required.									
i	25 Amps	Each	MR	113						
ii	32 Amps	Each	MR	115						
iii	40 Amps	Each	MR	207						
iv	63 Amps	Each	MR	304						
6.05	Providing, erecting & commissioning 4pole RCCB only of electro magnetic typewith 30/100/300 mA sensitivity									
i	16/25A 4 pole	Each	SOR	113						
ii	40A. 4 pole	Each	SOR	322						
iii	63A. 4 pole	Each	SOR	304						
6.06	Supplying and fixing following rating, double pole, 240 volts, MCB (B/C/D/ Curve) in the existing MCB DB complete with connections, testing and commissioning etc. as required.									
i	32 amps	Each	MR	142						
ii	40 amp	Each	MR	27						
	TOTAL SUB HEAD 6: MCB DISTRIBUTION BOARDS AS MENTIONED ABOVE									
7.00	SUBHEAD 7: UPS SYSTEM									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
7.01	UPS 5 KVA FOR COMMON AREA UPS LIGHTING (Section-1 and Section-2) (Hospital)									
	Supply, Installation, Testing and Commissioning of micro processor based 5KVA at 0.8 power factor at out put. with over all efficiency of minimum 92% at full load, True Online Double Conversion UPS using PWM IGBT technology. 3 Phase input 415 V +10% -15% and input frequency 50 Hertz plus minus 5%, 3 phase input and 3 phase output fixed setting at 380, 400 and 415V. UPS operating in parallel redundant load sharing mode (N+1) configuration and each comprising of the following:									
	(b) IGBT Rectifier input for achieving THDi<5% and Input power factor of greater than 0.99									
	(c)100% rated isolation transformer of H-class Delta/Star at the UPS output, after static bypass including cabling between UPS and transformer									
	(d) 100% rated Inbuilt static switch									
	(f) 100% rated Inbuilt Maintenance Bypass									
	(g) 100% rated moulded case circuit breaker having I thermal, magnetic and automatic U/V trip mechanics									
	(i) RS 485 port for BMS connectivity									
	(j) Supplying and installing Built-in suitable air-circulating fan .									
	Input phase reversal protection to be provided as standard, UPS should shift on battery and provide alarm.									
	(k) Supply, Installation, Testing and Commissioning of 12 V sealed maintenance free, Valve Regulated Lead Acid (VRLA) batteries for providing 30 minutes back up on each UPS at full load at 0.8 power factor.									
	(l) Supply, Fixing of battery rack for each UPS system along with interconnecting links, BCB etc as required									
	(m) UPS Should be provided with of Static Bypass Module having High Switching Frequency Microprocessor Based with builtin Technical Protections like Short Circuit, Overload, High/ Low Voltage cutoff protection of load from source inclusive of Bypass facility, SBM is activated during malfunctioning conditions of Load like:- -Short Circuit - Overload - Over temprature - Bypassing of particular load if reqd.									
	UPS 5 KVA COMMON AREA UPS LIGHTING AS MENTIONED ABOVE.	Set	MR	2						
7.02	UPS 160 KVA (For OT, ICU-NICU)									
	Supply, Installation, Testing and Commissioning of micro processor based 2 X80+1X80 KVA (N+1)at 0.8 power factor at out put. with over all efficiency of minimum 96% True Online Double Conversion UPS using PWM IGBT technology. 3 Phase input 380V;400V;415V , +10% -15% and input frequency 50 Hertz plus minus 5%, 3 phase input and 3 phase output fixed setting at 380, 400 and 415V. UPS operating in parallel redundant load sharing mode (N+1) configuration and each comprising of the following:									
	(a) 125% rated Rectifier cum charger unit + 100% rated inverter, integrated in UPS module									
	(b) IGBT Rectifier input for achieving THDi<5% and Input power factor of greater than 0.99									
	(c)100% rated external isolation transformer of H-class Delta/Star at the UPS output, after static bypass including cabling between UPS and transformer									
	(d) 100% rated Inbuilt static switch									
	(f) 100% rated Inbuilt Maintenance Bypass									
	(g) 100% rated moulded case circuit breaker having I thermal, magnetic and automatic U/V trip mechanics									
	(i) RS 485 port for BMS connectivity									
	(j) Supplying and installing Built-in suitable air-circulating fan .									
	Input phase reversal protection to be provided as standard, UPS should shift on battery and provide alarm.									
	(k) Supply, Installation, Testing and Commissioning of 12 V sealed maintenance free, Valve Regulated Lead Acid (VRLA) batteries for providing 30 minutes back up on each UPS at full load at 0.8 power factor.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	(l) Supply, Fixing of battery rack for each UPS system along with interconnecting links, BCB etc as required									
	(m) UPS Should be provided with of Static Bypass Module having High Switching Frequency Microprocessor Based with builtin Technical Protections like Short Circuit, Overload, High/ Low Voltage cutoff protection of load from source inclusive of Bypass facility, SBM is activated during malfunctioning conditions of Load like:- -Short Circuit - Overload - Over temprature - Bypassing of particular load if reqd. UPS 160 KVA AS MENTIONED ABOVE.	Set	MR	2						
	TOTAL SUBHEAD 7: UPS									
	SUB HEAD 8: WIRING									
8.00	WIRING									
8.06	Supplying and fixing suitable Modular metal box on surface or in recess including providing and fixing three nos 3 pin 5/6 amps. modular socket outlet with shutters and one no. 10 amps. modular type switch, base plate, modular cover plate, connections etc. and all civil works 'complete as required. (For computer Points)	Each	MR	2131						
8.07	Supplying and fixing suitable Module metal box on surface or in recess including providing and fixing two nos 3 pin 5/6 amps. with 2 no 5A modular switch on 6 Module modular plate & two 6 pin 15/16 amp modular socket outlet with 2 no. 16A/15A modular switch on 6 Module modular plate . , base plate, modular cover plate, connections etc. and all civil works 'complete as required. (For Comb-1/ Bed Point)	Each	MR	1700						
8.08	Supplying and fixing suitable Module metal box on surface or in recess including providing and fixing two nos 3 pin 5/6 amps. & one 6 pin 15/16 amp modular socket outlet with shutters and one no. 20 amps. modular switch, base plate, modular cover plate, connections etc. and all civil works 'complete as required. (For Comb-2/Consultant point)	Each	MR	595						
8.09	Supplying and fixing suitable Modular metal box surface or in recess including providing and fixing two nos 3 pin 5/6 amps. modular socket outlet with shutters and one no. 5 amps. modular type switch, base plate, modular cover plate, connections etc. and all civil works 'complete as required. (COMBO POINT-3/ TV Point)	Each	MR	444						
8.10	Supplying and fixing suitable module modular GI box on surface or in recess including providing and fixing 3 pin 20 A modular socket outlet with shutters and 20 AMP SP MCB, base plate, modular cover plate, etc. on surface or recess complete with all accessories including connections, testing and commissioning etc. as required.	Each	MR	275						
8.11	Supply and fixing following 20/32 Amps, 240 volts, 2P+E, Industrial Socket Outlet (with plugs) in a metal box with 20/32 SP MCB in a sheet steel cover on surface or recess complete with all accessories including connections, testing and commissioning etc. as required.	Each	MR	57						
8.12	Supply and fixing following 63/100 Amps, 240 volts, 2P+E, Industrial Socket Outlet (with plugs) in a metal box with 63/100 SP MCB in a sheet steel cover on surface or recess complete with all accessories including connections, testing and commissioning etc. as required.	Each	MR	16						
8.15	Supply and fixing following FP MCCB, 415 volts, 35 KA (Isc), Four Pole with thermal magnetic release having variable current setting (0.8 to 1.0 In) with Extended rotary operating mechanism including door interlocking with defeat feature and padlock facility in a sheet steel enclosure on surface complete with all accessories including , connections, testing and commissioning etc. as required.									
	i 63 Amp with RCCB	Each	MR	32						
	ii 100 Amp with RCCB	Each	MR	2						
	iii 125 Amp	Each	MR	10						
	iv 250 Amp	Each	MR	5						
	v 320Amp	Each	MR	4						
8.16	Supply, Installation, Testing & Commissioning of 360 degree Ceiling recess mountable 360 degree multifunction sensor that combines motion detection (PIR), Infrared remote control reception (IR) and ambient light level detection (PE) into one device.	Nos.	MR	4						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
8.17	Supply, Installation, Testing & Commissioning of Standalone Ceiling Mounted Motion PIR sensor 360 degree.	Nos.	MR	170						
8.18	Supply, Installation, Testing & Commissioning of Standalone Wall Mounted Motion PIR sensor 90 degree.	Nos.	MR	90						
8.19	Supply, Installation, Testing & Commissioning of floor Raceway of GI-150mmX25mm one compartment	meter	MR	100						
	TOTAL SUBHEAD 8: WIRING AS MENTIONED ABOVE									
	SUB HEAD 9: LIGHT FIXTURE AND FANS									
9.00	LIGHT FIXTURES AND FANS									
9.01	LED light fixture with high efficiency with Driver , tubes/lamps, reflector, diffuser, body/housing holder etc. complete with all fixing accessories as required.									
ii	Supplying of 2 x 20 W LED box type fluoresent light fixture (Philips BN108C LED 40S PSU CDL WH including Mounting Accessories, with minimum system lumen 2100 or approved equivalent from list of Makes)	Each	MR	395						
iv	Supplying of 2 x 20 W LED light fixture (Crompton IGP132LT8-16 withT-8 LED tube or Philips TMC 501 P1 with LED tube) including Mounting Accessories, with minimum system lumen 2100 or approved equivalent from list of Makes)	Each	MR	440						
vii	Supplying of LED recessed flush mounted light fixture (Full Glow (600mm), Philips RC380B G2 LED34S-6500 PSD OD WH or per requirement with minimum system lumen 3000 or approved equivalent from list of Makes) (FOR DALI)	Each	MR	300						
viii	Supplying of LED Surface mounted light fixture (PhilipsSP824 P LED 30S-5000 GR OA or Crompton LCTLS-40-CDL as per requirement with minimum system lumen 3000 or approved equivalent from list of Makes)(236SM01)	Each	MR	360						
x	Supplying of 1 x 14 W Mirror top with diffuser in 2ft variant (Crompton Greaves LINNET # LCL-14-CDL or approved equivalent from list of Makes)(wtoilet)	Each	MR	754						
xi	Supplying of 1 x 7 W Mirror top with diffuser in 2ft variant (Crompton Greaves LINNET # LCL-7-CDL or approved equivalent from list of Makes)(wtoilet)	Each	MR	603						
xii	Surface mounted Batten holder (Plastic) with 9 watt LED	Each	MR	200						
xvii	Supplying of 1X3 / 5 W LED Recessed flush mounted light fixture to be used as night lamp wall mounted (NLWM)	Each	MR	215						
xviii	Supplying of 1 x 10 W wall Bracket (Philips LED-1 x 10 W 45617/17 Vase or approved equivalent from list of Makes)(WB)	Each	MR	866						
xix	Supplying of 1X36 LED Surface mounted down light fixture (Crompton Greaves LCSFR4-36-CDL or approved equivalent)	Each	MR	20						
xx	Supplying of 1X50 LED Recess mounted down light fixture (Crompton Greaves Prakhar LCDNR-50-CDL/WW or approved equivalent)	Each	MR	20						
	TOTAL SUBHEAD 9: LIGHT FIXTURE & FANS AS MENTIONED ABOVE									
	SUB HEAD 10: TELEPHONE SYSTEM									
10.00	TELEPHONE SYSTEM									
10.07	DIGITAL EPABX SYSTEM (COMMUNICATION SERVER)									
a.	Supply, installation, testing & commissioning of 32 bit microprocessor based, fully digital, 100% non blocking, PCM-TDM, true ISDN & PRI Line and IP ready digital EPABX with distributed architecture for power supply cards, as per specifications with following configuration:									
	IP PBX 1100 Extensions Expandable type upto 3000									
	IP User -50 users									
	Configured For-									
	Analog P&T Lines- 24 (Expandable upto 12 Lines)									
	ISDN PRI Line (30 Channels)- 2 nos with CLIP Facility									
	24 Extension Digital Card : 1no									
	SUBSCRIBER INTERFACE:									
	Voice Mail system Consisting of Voice mail Boxes for all Users , Auto attended system with greeting messages PC for Attending voice mail system									
	Redundant Lan Port and Wan Port-2									
	Redundant Call Processor									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Redundant Power Supply									
	Full Software Licences & Support									
	In-built Music on Hold									
	Remote maintenance.									
	Ethernet port for LAN connectivity and System Management									
	Support for Voice over IP (VoIP)									
	Day/Night service									
	8 party conference Facility									
	Speed Dial									
	Support for OFC Connectivity									
	Support for Wi-Fi based wireless extensions.									
	System Documentation on CD-ROM									
	Hot Standby Duplication of all common control card without call disconnection.									
	IP Based operator Console with PC - 1 Nos.									
	should support IP Telephony and should be able to intergrate other EPBAX System on IP									
	DIGITAL EPABX SYSTEM AS MENTIONED ABOVE	SET	MR	1						
B	Floot Cum Boost Charger (FCBC)for Above EPBAX System 48 V/125 Amp Inculding SMS Batteries with 2 hr Battery Back Up)	Set	MR	1						
C	Supply ,Installation ,Testing and commissiing of IP Digital Phone having following features									
	IP Hard Console Phone									
	Full Colour VGA Display with 4096 different colours!									
	Full alphabetic keyboard									
	Key-based navigation									
	Hands free operation									
	Best in Class loudspeaker for speakerphone operation; also includes microphones									
	Jack for headset expansion									
	Compatible with PC applications									
	Bluetooth connectivity for the ultimate in integration									
	2 Ethernet ports									
	Downloadable admin softwar									
	Eight Personalized Ring Patterns.									
	Either desk or wall mountable.									
	DIGITAL IP PHONES AS MENTIONED ABOVE	SET	MR	20						
D.	24 port Layer 2 Switch 10/100/1000 GBPS for IP phone	Set	MR	4						
E	Supply ,Installation ,Testing and commissiing of Digital Phone having following features (Before procurement of this item, the contractor shall have necessary approval approval of quantity from HSCC/Client.									
	Adjustable graphical display									
	Resolution 64X128 pixels.									
	Size 70X38 mm									
	Socket for headset									
	40 Programmable keys									
	2X3 contextual keys, 2 personal keys/LED									
	Navigator keys 4 directions									
	Alphabetic keyboard (Dial by name)									
	Feature keys Like: Message + LED, Redial, End Key, Volume +/-, Mute with LED, Help, Handsfree with LED									
	Digital Phone AS MENTIONE ABOVE	SET	MR	10						
F	Supply of Analog phones having following features(Before procurement of this item, the contractor shall have necessary approval approval of quantivy from HSCC/Client.									
	FSK/DTMF Compatible Caller-Id									
	16 Digit LCD single Display									
	30 Incoming Memory									
	5 Outgoing Memory									
	Real Time Clock with Year, Date and Month display									
	Conversation Time Display (Approx.)									
	6 Step LCD Contrast Adjustable									
	36 Digits Redial Memory									
	Auto Filter Local Area Code up to 5-digit									
	Real time & Date in Idle Mode									
	Analog phones as mentoned above	Sets	MR	100						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
G	Supply of Analog phones Without display having following features ; Pulse or tune Dailing 3 repertory Keys, 10 Speed Dailing Number, Last Number redial , Manual Pause, Adjustable volume etc (Before procurement of this item, the contractor shall have necessary approval approval of quantity from HSCC/Client.	Set	MR	800						
10.08	Supply, installation, testing and commissioning of Main Distribution frame Exchanger side - Krone type 1000 pair with IPM (protection Magazine) including mounting frame, etc/ Complete as required as per specifications.	set	MR	1						
10.09	Supply, installation, testing and commissioning of Field Side Distribution frame Exchanger side - Krone type 1000 pair with IPM (protection Magazine) including mounting frame, etc/ Complete as required as per specifications.	set	MR	1						
	TOTAL SUBHEAD 10: TELEPHONE SYSTEM AS MENTIONED ABOVE									
	SUBHEAD 11: CONDUITING FOR COMPUTER SYSTEM .									
11.00	CONDUITING FOR COMPUTER SYSTEM .									
	TOTAL SUBHEAD: 11 CONDUITING FOR COMPUTER SYSTEM AS MENTIONED ABOVE									
	SUB HEAD 12: CONDUITING FOR TV OUTLETS									
12.00	CONDUITING FOR TV OUTLETS									
	TOTAL SUB HEAD 12: CONDUITING FOR TV OUTLETS AS MENTIONED ABOVE									
13.00	SUBHEAD 13: FIRE ALARM SYSTEM									
A	ADDRESSABLE FIRE ALARM SYSTEM									
	Fire Panel & Annunciators									
1	Supply,Installation Testing and Commissioning of Microprocessor based Multi-loop, True Peer-to-Peer Networkable Addressable Fire Alarm Control Panel with minimum 600 characters LCD display, 4000 event plus 1000 alarm log history events, QWERTY keypad for programming. The panel should be equipped with sufficient numbers of loops considering 20% spare capacity in each loop. Each loop shall have a capacity of minimum 300 analog addressable devices. The panel shall work in degrade mode in case of CPU failure. Four access levels, flash EPROM, 240 volts AC power supply, automatic battery charger, 24 volts sealed lead acid batteries sufficient for 24 hours normal working and 30 mins in alarm condition. The panel shall be complete with Integrated 8 channel Digital Voice Evacuation System Controller capable of broadcasting Evacuation Messages on same peer-to-peer Network and 2 ways Communication Fire Fighters System capable of supervising all the speaker circuits with adequate zone control and accessories. The system shall be equipped with necessary Digital Audio Amplifier capable of processing one of 8 audio channels and amplifiers as per the speakers requirement at 70.7 VRMS output along with necessary enclosures. The DAA shall be fully monitored for fault and alarm reporting. The proposed Digital Amplifiers shall not be rail mounted / dependant on Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of Amplifier operation.The Digital Amplifier Loop shall have N+1 Redundancy concept to avoid chances of failure. The Fire Fighters Telephone System shall be capable of having minimum 35 Telephones on conference.UL Listed									
a	10-loop - With Digital Voice Command Center	Nos.	MR	1						
b	6-loop - With Digital Voice Command Center	Nos.	MR	1						
c	5-loop - With Digital Voice Command Center	Nos.	MR	1						
d	3-loop - With Digital Voice Command Center	Nos.	MR	1						
e	2-loop - With Digital Voice Command Center	Nos.	MR	1						
2	Supply,Installation Testing and Commissioning of Network Repeater Panel with minimum 600 characters LCD display & programmable QWERTY Keypad and mapping minimum 2,00,000 points on network. The NRP shall act as an independent node communicating on the peer to peer network and shall not be dependant on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of NRP operation..UL Listed	Nos.	MR	1						
3	Supply,Installation Testing and Commissioning of Digital Audio Amplifier capable of processing One of 8 audio channels and total of 100 W at 70.7 VRMS output along with necessary enclosures. The Digital Audio Amplifier shall be fully monitored for fault and alarm reporting. The proposed Digital Audio Amplifiers shall (be Wall/Panel Mounted) not be rail mounted / dependant on Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of Amplifier operation..UL Listed & FM Approved	Nos.	MR	9						
B	Software & Gateways									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
1	Supply,Installation Testing and Commissioning of Graphics User Interface for Monitoring & Control of complete Fire, Voice Evacuation & Telephone Talkback System. The GUI based main network software shall network with other panels on True Peer-to-Peer network. It shall be capable of graphically representing each facility being monitored with floor plans and icons depicting the actual locations of the various systems, and / or sensors' locations. It shall have the facility to change the sensitivity of any detector. The software shall be capable of monitoring 200 Nodes with 100 MB baud Transmission rate on Fibre Optics Network and 12 MB baud Transmission on cable and 2,50,000 network points. The software shall provide the facility to Monitor, Control all the Digital PAVA as well as 2 way communication from main control room using voice signals over Fire Network along with the Fire detection signal. The Graphic workstation shall act as an independent node communicating on the peer to peer network and shall not be dependant on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of GUL.UL Listed	Nos.	MR	1						
2	Supply,Installation Testing and Commissioning of MODbus Interface Gateway for communication with BMS / Other Utilities. MODbus shall support 22500 data points. MODbus Gateway shall act as an independent node communicating on the peer to peer network and shall not be dependant on the Fire Panel CPU for operation. Failure of Fire Panel CPU shall not result in failure of MODbus Gateway.	Nos.	MR	1						
3	Supply,Installation Testing and Commissioning of Workstation latest Intel® i7 7th Generation, processor, Intel Chipset motherboard, 4 GB DDR3 RAM, 1 TB SATA HDD at 7200 rpm, Graphic card with 2 GB dedicated RAM with display ports/DVI/ HDMI port, DVD writer, Giga LAN Card, Keyboard, optical Mouse , 650 VA UPS etc. complete as required.	Nos.	MR	1						
C	Detectors									
1	Supply,Installation Testing and Commissioning of Addressable Photoelectric Smoke Detector. The detector shall have multi co-operative sensing technology for faster response & avoid false alarms. The detector shall have twin bi-colour LED for 360 deg viewing. Addressing shall be with user friendly rotary decimal switches..UL Listed	Nos.	MR	1910						
2	Supply,Installation Testing and Commissioning of Addressable Multi-criteria Photo-Thermal Detector with sensitivity range of 0.5 to 2.5% obs/ft.The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena. The detector shall adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings for early detection and reduction in false alarm. The detector shall have twin bi-colour LED for 360 deg viewing. Addressing shall be with user friendly rotary decimal switches..UL Listed	Nos.	MR	1307						
3	Supply,Installation Testing and Commissioning of Addressable Rate of Rise Heat Detector rated at 9.4 deg C/min. The detector shall have twin bi-colour LED for 360 deg viewing. Addressing shall be with user friendly rotary decimal switches..UL Listed	Nos.	MR	65						
4	Supply,Installation Testing and Commissioning of Addressable Duct Smoke Detector. The duct detector shall have an air velocity rating from 100 to 4000 ft/min. The detector shall have twin bi-colour LED for 360 deg viewing. Addressing shall be with user friendly rotary decimal switches.	Nos.	MR	38						
D	Modules									
1	Supply,Installation Testing and Commissioning of Addressable Manual Call Point (Pull down / Break Glass Type). The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device..UL Listed & FM Approved	Nos.	MR	106						
2	Supply,Installation Testing and Commissioning of Addressable Control Module for Sounders / Strobes / Sounder cum Strobes. The control module shall provide DPDTcontact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance..UL Listed	Nos.	MR	106						
3	Supply,Installation Testing and Commissioning of Addressable Relay Module for AHU, Access Control, Lifts, Staircase Pressurization, Fire Suppression & other Third Party Outputs. The relay module shall provide DPDTcontact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance..UL Listed	Nos.	MR	76						
4	Supply,Installation Testing and Commissioning of Addressable Monitor Module for Sprinklers, Panic Bars & other Third Party Inputs. The monitor module shall provide DPDTcontact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance..UL Listed	Nos.	MR	89						
5	Supply,Installation Testing and Commissioning of Addressable Isolator Base for Isolating short / dewired / loose circuits with automatic resetting arrangement. Isolator Base can also be proposed, however in that case needs to be considered with each detector & module. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance..UL Listed & FM Approved	Nos.	MR	180						
6	Supply,Installation Testing and Commissioning of Addressable Telephone Module for interfacing with Telephone Jack for Fire Fighters Telephone Communication application. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance..UL Listed	Nos.	MR	106						
E	Notification Devices									
1	Supply,Installation Testing and Commissioning of Addressable Sounder cum Strobe rated at 75 dBA @ 3m for Audible annunciation and 75cd flashing at 1 Hz for visual indication..with power supply etc UL Listed & FM Approved	Nos.	MR	106						
2	Supply,Installation Testing and Commissioning of 2W Multi-Tap (0.25W; 0.5W; 1W; 2W), Ceiling Mount Speakers. The speakers shall be of same make as that of the Control Panel & Amplifiers. They shall be compatible with supplied Amplifiers and shall work on 70.7Vrms..UL Listed & FM Approved	Nos.	MR	455						
3	Supply,Installation Testing and Commissioning of 2W Multi-Tap (0.25W; 0.5W; 1W; 2W), Wall Mount Speakers. The speakers shall be of same make as that of the Control Panel & Amplifiers. They shall be compatible with supplied Amplifiers and shall work on 70.7Vrms..UL Listed	Nos.	MR	24						
4	Supply,Installation Testing and Commissioning of Addressable Directional Sounders with 20 hz to 20 khz operating frequency with minimum 8 distinct sound patterns to indicate corridors, Exit doors, Move upward, move downward etc. to direct Occupants for fast & safe Evacuation.	Nos.	MR	5						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
F	Telephone Talkback									
1	Supply,Installation Testing and Commissioning of Addressable Fire Fighter's Telephone Jack with suitable module for two way communication between Remote Fire Fighter & Fire Command Center	Nos.	MR	106						
2	Supply,Installation Testing and Commissioning of Fire Fighter's Telephone Handset for two way communication between Remote Fire Fighter & Fire Command Center	Nos.	MR	12						
G	Cables & Conduits									
3	Supply and drawing of 2 C X 1.5 Sq mm multi stranded twisted unshielded FRLS Copper cable.	Rmt.		45380						
c	Supply and laying of 2X1.5 Sqmm Copper Conductor, PVC Insulated wrapped with melinex Tape and overall PVC sheathed multicore Armoured Cable	Mtr.	MR	1500						
B	Conventional Fire alarm system									
1	Supply, Installation, Testing & Commissioning of Main fire alarm panel of following Zone microcontroller based with its own fire detection zone interface card for initiating and indicating devices , power supply & Battery Charger. with LED for fault / isolate / fire alarm condition, short, open condition The batteries shall be sufficient for 30 Mins. in alarm Condition and 48 Mins in normal condition.									
a	2- Zonel Panel	Nos.	MR	1						
b	4- Zone panel	Nos.	MR	1						
c	8- zone Panel	Nos.	MR	4						
2	Supply, installation, testing & commissioning of MANUAL CALL POINT complete with UPVC box duly painted in red colour including connections etc.	Nos.	MR	72						
3	Supply, Installation, testing & commissioning of Hooter with 24 volt circuit complete as required	Nos.	MR	72						
4	Cables & Conduits									
c	Supply & laying of 2 X 1.5 sqmm Flexible Copper Conductor FRLS Cable in existing conduit.	Mtr.	MR	22000						
	TOTAL SUB HEAD 13: FIRE ALARM SYSTEM as mentioned above									
14.00	SUBHEAD 14: OUTDOOR PA SYSTEM									
1	Supply, Installation , Testing and Commissioning of Landscape garden speaker built-in 70v/ 100v transformer. The built-in 6.5"+1.5" two-way waterproof speaker driver is designed of wide frequency response 120-15kHz, the multiple power taps of 12.5W & 25W with Heavy damage proof nish, Max. SPL (Rated W/ 1M) 108dB±3dB.	Nos.	MR	18						
2	Supply, Installation , Testing and Commissioning of IP network audio adopter built-in digital class-D 500W amplifier Direct to receive internet audio source and transmit to 70V, 100V and low impedance loudspeakers. Non-dedicated network system solution. Could be installed anywhere of the LAN network. Economy network audio solution for multiple speaker applications.	Nos.	MR	1						
3	Supply, Installation , Testing and Commissioning of Horn speaker built-in 70v/ 100v transformer The built-in horn speaker driver is designed of wide frequency response 250-8kHz, the multiple power taps 7.5W & 15W.	Nos.	MR	10						
4	Supply, Installation , Testing and Commissioning of IP network audio adopter built-in digital class-D 500W amplifier Direct to receive internet audio source and transmit to 70V, 100V and low impedance loudspeakers. Non-dedicated network system solution. Could be installed anywhere of the LAN network. Economy network audio solution for multiple speaker applications.	Nos.	MR	2						
5	Supply, Installation , Testing and Commissioning of IP Network Audio Adaptor for the Integration with Third Partv Audio System.	Nos.	MR	1						
6	Supply, Installation , Testing and Commissioning of Built-in single channel TCP/ IP decoder Decode digital audio data to analogue ampli er Hear of IP background music, zone paging & voice alarm system Built-in 3.4-inch LCD screen display the IP address and status in English n.	Nos.	MR	1						
7	Supply, Installation , Testing and Commissioning of The IP network paging microphone has several paging modes include: zone paging, group paging, all zone paging, two-way intercom, conference system, discussion system & voting system. The IP network paging microphone is built-in a LCD to display program status and its IP address, end-user is accessible to change the IP setting.	Nos.	MR	6						
8	Supply, Installation , Testing and Commissioning of SOFTWARE	Nos.	MR	1						
9	Supply, Installation , Testing and Commissioning of PC	Nos.	MR	1						
10	Supply, Installation , Testing and Commissioning of Speaker Cable	RM	MR	2800						
11	Supply, Installation , Testing and Commissioning of Microphone Cable	RM	MR	800						
12	Supply, Installation , Testing and Commissioning of Cat6A Cable	RM	MR	2200						
	TOTAL SUB HEAD 14: OUTDOOR PA SYSTEM as mentioned above									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	SUB HEAD 15: CCTV SURVEILLANCE SYSTEM									
15.00	CCTV SURVEILLANCE SYSTEM									
1	Supply of Outdoor IR 1080p60fps HD PTZ Camera with 1/2.8" progressive scan Exmor CMOS, Effective pixels 1920 x 1080 approx. 2.1M pixels, 30x Optical Zoom 4.5 mm - 135 mm (F1.6 - F4.4), Optical Zoom Field of View (FOV) : 2.4° - 60.9°, 16X Digital Zoom, Minimum Illumination- Sense up on-Color: 0.05 lux, B/W: 0.01 lux, With infrared (IR) 0 lux, WDR 90dB, Video Analysis (Object removal, Loitering, Enter or Exit from the Field, Object Classification etc.) Intelligent Dynamic Noise Reduction, BLC, White Balance, Mechanical switchable IR filter, Pan Range 360° continuous, Tilt Range 0°-90°, Pan/Tilt Modes - Pan: 0.1"/s - 240"/s; Tilt: 0.1"/s - 120"/s, Presets 256, Tours, IR distance 150 m (590 feet) (Detection), IR can be internal or external with full 360 deg PAN coverage. Audio- 1/1 Channel In/Out, Memory card slot (support upto 1TB), 24 individually configurable privacy masks, Simple single cable installation with POE+ support for indoor/outdoor application, Defog, IP66, ONVIF Profiles S & G, CE, UL Certified.	No's	MR	5						
2	Supply of 2MP 30 fps HD Outdoor IR IP bullet camera with 1/2.9-inch CMOS, Sensor pixels 1920 (H) x 1080(V), Sensitivity-0.24 lx (color) 0.05 lx (mono), IR range 60 mtrs, Dynamic range 84 db, True day/night, Automatic Electronic Shutter, Video compression H.265 MP; M-JPEG, White balance, BLC, H.265 quad-streaming, Video Analysis (Object removal, Loitering, Enter or Exit from the Field, Object Classification etc.), Privacy Mask, Analog video output, Auto Varifocal Lens (zoom / focus) 2.8mm to 12 mm lens, Two-way, full duplex Audio, Audio compression AAC, G.711, L16 (live and recording), 60 s pre-alarm recording Memory card slot support upto 256 GB, IP66, ONVIF Profile S, CE, UL, FCC Certified.	No's	MR	24						
3	Supply, installation & testing of 1080p HD Indoor IP Dome camera with 1/2.7-inch CMOS, Sensor pixels 1920 x 1080, Sensitivity-0.24 lx (color) 0.05 lx (mono), Dynamic range, True day/night, Automatic Electronic Shutter, Video compression H.264 MP (Main Profile); M-JPEG, White balance, BLC, H.264 quad-streaming, Motion/tamper/audio detection, Privacy Mask, Motion detection, Tamper alarm, Auto Varifocal Lens 3 to 10 mm lens, Built-in microphone, Two-way, full duplex Audio, Audio compression AAC, G.711, L16 (live and recording), Memory card slot (support upto 1TB), 3-axis adjustment (pan/tilt/ rotation), ONVIF Profile S, CE, UL, FCC Certified.	No's	MR	284						
4	Supply of 5MP sensor Indoor panoramic camera with 1/2.3-inch CMOS, Video compression H.264 (MP); M- JPEG, The effective resolution for the 360° 5MP; 1.6 mm fixed-focus lens; Electronic Day/Night, White Balance, Automatic Electronic Shutter, Backlight compensation, Intelligent Dynamic Noise Reduction (IDNR), Privacy Masking Eight independent areas, Pixel counter Integrated microphone, Signal-to-Noise Ratio, Full-duplex / half duplex Audio Streaming, Memory card slot (support upto 1TB, 10/100 Base-T, ONVIF Profile S, Edge dewarping, 360° lens, PoE. Shop drawings shall be approved by Architect before procurement.	No's	MR	22						
5	Supply of server for video management, recording and failover management with N+N configuration suitable for proposed system complete with required hardware, as per detail enclosed specification & list of approved make.	Lot	MR	2						
6	Supplying, Installation, Testing & Commissioning of Enterprise-class Client / Server based video management System Software for license of min 200 camera and 4 client workstation with alarm priorities and selectable user group distribution, Support Mobile video client for live and playback, Support 3rd Party ONVIF S profile, RTSP, http, camera with PTZ functionality if required in future, Dual Authorization, Supports Forensic Search, Different Time Zone Support, Support Remote Access, Automatically Map the cameras goes into which storage, Support 4 Monitors per Client, complete in all respects as per specifications. VMS shall support continuous operation during management server down-times as live viewing, playback of recording and export of video data. It shall have feature of System Monitoring 1) System-wide health monitoring, including cameras, computers, and software. 2) Network equipment and other third-party devices monitored with SNMP.	Lot	MR	2						
7	Supply, Installation Testing and Commissioning of network storage solution with redundant hot-swappable power supplies and cooling fans. Dual Intel i210AT Gigabit LAN Ethernet ports for highest speed iSCSI connectivity. It shall offer Remote monitoring via desktop application, browser or SNMP. It shall provide a minimum of 128 concurrent iSCSI connections. It shall have 64 TB raw capacity, after RAID 6 configuration usable storage should be 44 TB as per list of approved makes. (minimum 256TB (64 TB x 4 Box) is required, bidder has to submit storage calculation from OEM & propose hard disk for minimum 30 days continuous recording of all the cameras at full resolution & full frame rate, from the calculation if hard disc capacity comes more than 256 TB then bidder has to supply the same without extra cost. Bidder has to provide minimum 4 storage boxes. In case of failover of 1 or more boxes recording should be continues on balance boxes or even in one box)	Lot	MR	2						
8	Supply, Installation & Commissioning of Workstation latest Intel® i7 7th Generation, processor, Intel Chipset motherboard, 8GB DDR3 RAM, 500 GB SATA HDD at 7200 rpm, Graphic card with 2 GB dedicated RAM with display ports/DVI/ HDMI port, DVD writer, Giga LAN Card, Keyboard, optical Mouse as per list of approved makes.	Lot	MR	8						
9	Supply, Installation & Commissioning of 32" Monitor complete as required	No's	MR	8						
10	Supply, Installation, Testing & Commissioning of 12 ports full loaded LIU Box with all the required pigtailed complete in all respect up to entire satisfaction Engineer in charge of works. Make: D-Link/Amp/Molex/Schneider	No's	MR	8						
11	Supply, Installation, Testing & Commissioning of 1-port 1000BASE-LX Small Form Factor Pluggable (SFP) Gigabit Ethernet Transceiver, connector type: LC, Digital Diagnostic Monitoring Interface. Complete in all respect up to entire satisfaction Engineer in charge of works. Switch and SFP should be from same OEM only Make: CISCO/ Juniper/ Extreme	No's	MR	34						
12	Supply, Installation, Testing & Commissioning of OFC Patch Cord. Make: D-Link/Amp/Molex/Schneider	No's	MR	40						
13	Supply, Installation, Testing and commissioning of Managable 24 port Switch with Power on Ethernet (PoE) enabled, 10/100, RJ45 Access ports complete as required	No's	MR	12						
14	Supply, Installation, Testing and commissioning of Layer -2 Switch with Power on Ethernet (PoE) enabled, 24 x Gigabit RJ45 Access ports with PoE+, including 2 x Combo Gigabit ports, plus 2 x 10 Gigabit SFP+ Uplink ports, and 2 x 10 Gigabit SFP+ dual-use Stack/Uplink ports, All 24 access ports should be capable of providing 30W of Power budget Non-Blocking Switching fabric of 128 GBPS and Forwarding rate of 95 MBPS, 16 K MAC Address and 256 VLAN Operating Temperature - 0 to 50° C, RIP v1/v2 Dynamic IP Routing, DHCPv6 Guard, Multicast Listener Discovery v1/v2 Snooping & Proxy, IPv6 features, including First-Hop Security, Neighbour Discovery Inspection, Source Guard, and Router Advertisement Guard with 600VA UPS, 15M Backup, Internal SMF Batteries Switch and SFP should be from same OEM only Make: Cisco/ Araya / Extreme/Juniper UPS Make: APC/Emerson/Eaton	No's	MR	8						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
15	Supply, Installation, Testing and commissioning Core Switch Layer 3 Port Density : 12 x 10/100/1000 Base-T PoE+ ports, 36 x 1G SFP ports and two 10G SFP+ uplink port ,Switching Fabric - 172 Gbps Packer Forwarding - 100 Mbps, 32K MAC Addresses and 4K VLAN and Switch configured with 2GB of 800 DDR3 DRAM JUMBO FRAME : At least 9Kb support , Make: Cisco/ Avaya / Extreme	No's	MR	2						
16	Supply, Installation, Testing & Commissioning of 24 Port Patch Panel. Make: D-Link/Amp/Molex/ Schneider	No's	MR	1						
17	Supply, Installation, Testing & Commissioning of 6U rack indoor/outdoor for switch Mounting with Fan and power Strip, PDU, Hardware Mounting Kit Make: Comrack/HCL/Rittal/ Dynamic/Rackom	No's	MR	25						
18	Supply, Installation, Testing & Commissioning of 42U rack for switch Mounting with Fan and power Strip, PDU, Hardware Mounting Kit Make: Comrack/ HCL/ Rittal/Dynamic	No's	MR	2						
19	Supply,Installation,Testing & Commissioning of 3 Core Power Cable 1.5 sqmm . Make :Finolex/ Polycab /Havells	Lot	MR	5500						
20	Supply, Installation, Testing & Commissioning of Single mode 6 OFC ARMoured cable. Make: D-Link/Amp/Molex/Schneider	Meter	MR	500						
21	Supply, Installation, Testing & Commissioning of CAT 6 STP Cable complete in all respect up to entire satisfaction Engineer in charge of works. Make: D-Link/Amp/Molex/Schneider	Meter	MR	8500						
24	Supply, Installation, Testing and Commissioning of 10 KVA UPS On Line With 1 hour Backup complete in all respect up to entire satisfaction Engineer in charge of works. MAKE: Numeric/APC/Emerson/DELTA	No's	MR	2						
25	Supply, Installation, Testing and Commissioning of 10/100/1000 Media Converter. Make: D-Link/Amp/Molex/Schneider/MRO-TEK/ Extreme	No's	MR	25						
26	Supply,Installation ,Testing and Commissioning of Junction Box.Make: Rittal/Hensal/Comrack/Dynamic	No's	MR	25						
27	Supply, Installation ,Testing and Commissioning of HDPE conduit 40mm. Make: Berlia/Duraline/Reliance/Westwell	Meter	MR	2500						
	(a)Hard Digging	Meter	MR	200						
	(b)Soft Digging	Meter	MR	400						
28	Supply, Installation, Testing & Commissioning of 5 Metre long GI Pole with suitable cement concrete foundation including excavator, including supply and fixing of foundation & all civil work suitable for outdoor camera including connection etc. complete as per specifications & as required.	No's	MR	5						
	TOTAL SUB HEAD 15: CCTV SURVEILLANCE SYSTEM as mentioned above									
	SUB HEAD 16: NURSE CALL SYSTEM									
1	Supply,Installation Testing and Commissioning of Microprocessor controller Nurses station with terminal monitor with in built power supply , with charger enclosed in a powder coated cabinet . Having with Reset, alarm/ buzzer, Call acknowledge with battery back up, battery charger complete system as per technical specifications and as per required of following suitable configuration.omni call complete as required									
a	8 Way	Nos	MR	2						
b	16 Way	Nos	MR	3						
c	24Way	Nos	MR	1						
d	32 Way	Nos	MR	9						
e	40 Way	Nos	MR	3						
2	Supply Installation Testing & Commissioning of Bed Call Push Button with LED indication and Flexiable Cord with button , Call Reset , Call Indication, station for each Bed omni call complete as required.	Nos	MR	655						
3	Supply Installation Testing & Commissioning of Toilet Call Push Button with LED indication and flexiable cord with button , Call Reset , Call Indication, station for each Bed omni call complete as required.	Nos	MR	150						
4	Supply Installation Testing & Commissioning of LED Indicators Module at Outside of each ward omnical complete as required.	Nos	MR	90						
5	Supply ,laying and testing of 6CX0.5 Sqmm diameter multistand copper conductor PVC cable in existing MS/PVC Conduit on recessed/surface with all accessories complete as required	Mtr	MR	9087						
6	Supply, laying and testing of 2CX0.5 Sqmm diameter multistand copper conductor PVC cable in existing MS/PVC Conduit on recessed/surface with all accessories complete as required	Mtr	MR	1500						
	TOTAL SUB HEAD 16: NURSE CALL SYSTEM AS MENTIONED ABOVE									
	SUB HEAD 17: LIFTS									
17.00	LIFTS									
17.01	Design, manufacture, supply, installation, testing and commissioning of following 20 passenger cum hospital (1360 kg) lift , serving different floors in the lift shaft including machine room at the top. Lift should be gearless. The lift should be as per detailed specification/ drawing enclosed as required and as under:									
-	Travel: As per architectural drawing.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
-	Controller: A.C. variable voltage & variable frequency									
-	Automatic rescue device complete with dry maintenance free batteries as required.									
-	Operation: Microprocessor based single automatic push button/ simplex selective collective/duplex collective selective with / without attendant.									
-	415 V, 3 phase, 50 Hz, 4 wire system									
-	Type of doors: a) Car : Power operated, Side opening, horizontal sliding stainless steel (b) Landing doors: Stainless steel Hairline Mat finish Lift landing doors shall have a fire resistance of one hour.									
	SS Plate finishing on all around the lift Jamb opening including overlapping of front facia all LOP (Local operating Panel) alarm , fire man switch,will be on landing frame the finishing of frame will be as that of door.									
-	All push buttons will have Brail also.									
-	Car Enclosure : stainless steel- Hairline Mat finish									
	Provision of CCTV in lift car									
-	A hand rail guide not less than 600 mm long at 900 mm above floor level .									
-	Mirror of suitable size to be fixed inside the lift car.									
-	Voice announcement system in the car to announce the position of the elevator in the hoistway as the car passes or stops at a floor served by the elevator.									
-	Telephone with minimum two connections one at operator's room and other at guard/ security room and the emergency signal with re-chargeable batteries as source of supply be made in the lift car.									
-	Toe guard, IR curtain on full height, two phase fireman's drive control/ switch and potential free contacts etc to be provided.									
i	Floor : B+G+6 (8 stops & 8 openings) (Speed- 1MPS)	Each	MR	12						
ii	Floor : G+2 (3 stops & 3 openings) (Speed- 1MPS)	Each	MR	2						
17.02	Design, manufacture, supply, installation, testing and commissioning of following 13 passenger (884 kg) lift , serving different floors in the lift shaft including machine room at the top. Lift should be gearless. The lift should be as per detailed specification/ drawing enclosed as required and as under:									
-	Travel: As per architectural drawing.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	- Speed : 1.5 MPS									
	- Contoller: A.C. variable voltage & variable frequency									
	- Automatic rescue device complete with dry maintenance free batteries as required.									
	- Operation: Microprocessor based single automatic push button/ simplex selective collective/duplex collective selective with / without attendant.									
	- 415 V, 3 phase, 50 Hz, 4 wire system									
	- Type of doors: a) Car : Power operated, central opening, horizontal sliding stainless steel (b) Landing doors: Stainless steel Hairline Mat finish Lift landing doors shall have a fire resistance of one hour.									
	SS Plate finishing on all around the lift Jamb opening enclosing overlapping of front facia all LOP (Local operating Panel) alarm , fire man switch,will be on landing frame the finishing of frame will be as that of door.									
	- Car Enclosure : stainless steel- Hairline Mat finish									
	- All push buttons will have Brail also.									
	Provision of CCTV in lift car									
	- A hand rail guide not less than 600 mm long at 900 mm above floor level .									
	- Mirror of suitable size to be fixed inside the lift car.									
	- Voice announcement system in the car to announce the position of the elevator in the hoistway as the car passes or stops at a floor served by the elevator.									
	- Telephone with minimum two connections one at operator's room and other at guard/ security room and the emergency signal with re-chargeable batteries as source of supply be made in the lift car.									
	- IR curtain on full height, two phase fireman's drive control/ switch and potential free contacts etc to be provided.									
	i Floors : G+9, (10 stops & 10 openings)	Each	MR	2						
	ii Floors : G+8, (9 stops & 9 openings)	Each	MR	1						
	iii Floors : G+7, (8 stops & 8 openings)	Each	MR	1						
	iv Floors : G+5, (6 stops & 6 openings)	Each	MR	1						
	v Floors : G+4, (5 stops & 5 openings)	Each	MR	4						
	vi Floors : G+2, (3 stops & 3 openings)	Each	MR	4						
17.03	Design, manufacture, supply, installation, testing and commissioning of following 10 passenger (680 kg) lift , s serving different floors in the lift shaft including machine room at the top. Lift should be gearless. The lift should be as per detailed specification/ drawing enclosed as required and as under:									
	- Travel: As per architectural drawing.									
	- Speed : 1 MPS									
	- Contoller: A.C. variable voltage & variable frequency									
	- Automatic rescue device complete with dry maintenance free batteries as required.									
	- Operation: Microprocessor based single automatic push button/ simplex selective collective/duplex collective selective with / without attendant.									
	- 415 V, 3 phase, 50 Hz, 4 wire system									
	- Type of doors: a) Car : Power operated, central opening, horizontal sliding stainless steel (b) Landing doors: Stainless steel Hairline Mat finish Lift landing doors shall have a fire resistance of one hour.									
	SS Plate finishing on all around the lift Jamb opening enclosing overlapping of front facia all LOP (Local operating Panel) alarm , fire man switch,will be on landing frame the finishing of frame will be as that of door.									
	- Car Enclosure : stainless steel- Hairline Mat finish									
	- All push buttons will have Brail also.									
	Provision of CCTV in lift car									
	- A hand rail guide not less than 600 mm long at 900 mm above floor level .									
	- Mirror of suitable size to be fixed inside the lift car.									
	- Voice announcement system in the car to announce the position of the elevator in the hoistway as the car passes or stops at a floor served by the elevator.									
	- Telephone with minimum two connections one at operator's room and other at guard/ security room and the emergency signal with re-chargeable batteries as source of supply be made in the lift car.									
	- IR curtain on full height, two phase fireman's drive control/ switch and potential free contacts etc to be provided.									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
i	Floors : G+6, (7 stops & 7 openings)	Each	MR	2						
ii	Floors : G+4, (5 stops & 5 openings)	Each	MR	2						
	TOTAL SUB HEAD 17: LIFTS AS MENTIONED ABOVE									
	SUB HEAD 18: LT CABLES									
18.00	LT CABLES									
18.01	Supply of following sizes of 1.1 kV grade multicore aluminium conductor PVC sheathed armoured XLPE cable as per IS 7098.									
i	3.5 Core 25 Sqmm.	Metre	MR	7700						
ii	3.5 Core 35 Sqmm.	Metre	MR	200						
iii	3.5 Core 50 Sqmm.	Metre	MR	700						
iv	3.5 Core 70 Sqmm.	Metre	MR	2150						
v	3.5 Core 95 Sqmm.	Metre	MR	100						
vi	3.5 Core 120 Sqmm.	Metre	MR	750						
vii	3.5 Core 150 Sqmm.	Metre	MR	2100						
viii	3.5 Core 185Sqmm.	Metre	MR	2300						
ix	3.5 Core 240 Sqmm.	Metre	MR	2100						
x	3.5 Core 300 Sqmm.	Metre	MR	12000						
xi	3.5 Core 400 Sqmm.	Metre	MR	1100						
xii	4 Core 16 Sq mm	Metre	MR	2400						
xiii	4 Core 10Sq mm	Metre	MR	1800						
xiv	4 Core 6 Sq mm	Metre	MR	100						
xv	3 Core 6 Sqmm.	Metre	MR	100						
xvi	3 Core 4 Sqmm.	Metre	MR	100						
xvii	2 Core 10 Sq mm	Metre	MR	7480						
xviii	2 Core 16 Sq mm	Metre	MR	1600						
	TOTAL SUBHEAD 18: LT CABLES AS MENTIONED ABOVE									
	SUBHEAD 19: EARTHING									
19.00	EARTHING									
19.01	Supply and installation of one number earth pit with advance maintenance free Earthing System consisting of one Number, CPRI tested copper bonded steel electrode of minimum 25 mm dia. (as per IE C62561-2) With a minimum coating thickness of 250 microns and length of 3 meters, 25 kg/Electrode of earth enhancing compound (tested as per IEC-62561-7) fill the 100mm augered hole surrounding to the electrode , SS Universal Clamp of Size 175X50X3 mm for terminal Connection including Poly Propylene Heavy duty Pit cover including all accessories , excavation of earth, filling with back fill compound, and earth pit marking. The Complete installation shall be as per the drawing, technical specifications and as required	Set	MR	50						
19.02	Supply and installation of one number earth pit with advance maintenance free Earthing System consisting of one Number, CPRI tested copper bonded steel electrode of minimum 19 mm dia (as per IE C62561-2) With a minimum. coating thickness of 250 microns and length of 3 meters. 25 kg/Electrode of earth enhancing compound (tested as per IEC-62561-7) fill the 100mm augered hole surrounding to the electrode , SS Universal Clamp of Size 175X50X3 mm for terminal Connection including Poly Propylene Heavy duty Pit cover including all accessories , excavation of earth, filling with back fill compound, and earth pit marking. The Complete installation shall be as per the drawing, technical specifications and as required	Set	MR	80						
19.03	Supply and installation of one number earth pit with of advance maintenance free Earthing System consisting of one Number UL Listed CPRI tested copper bonded steel electrode of minimum 13 mm dia. (as per IE C62561-2) With a minimum. coating thickness of 250 microns and length of 3 meters. 25 kg/Electrode of earth enhancing compound (tested as per IEC-62561-7) fill the 100mm augered hole surrounding to the electrode , SS Universal Clamp of Size 175X50X3 mm for terminal Connection including Poly Propylene Heavy duty Pit cover including all accessories , excavation of earth, filling with back fill compound, and earth pit marking. The Complete installation shall be as per the drawing, technical specifications and as required	Set	MR	40						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
19.04	Supply and installation of one number earth pit with of maintenance free earthing system consisting of 1250 mm long copper bonded steel electrode of minimum 13 mm dia. tested as per IEC 62561-2. Minimum copper coating thickness on Rod is 100 microns. 5 kg/Electrode of earth enhancing compound tested as per IEC 62561-7 fill the 75-100mm augered hole surrounding to the electrode. It consist the following Item opper Alloy clamp suitable Poly Propylene Heavy duty Pit cover including all accessories , excavation of earth, filling with back fill compound, and earth pit marking. The Complete installation shall be as per the drawing, technical specifications and as required	Set	MR	8						
19.05	Supplying and laying 25mmX5mm GI strip at 0.5m below ground level as strip earth electrode, including soldering etc. as required.	Metre	MR	1000						
19.06	Providing and fixing 25mmX5mm GI strip on surface/on existing cable trench/RCC pipe/GI pipe or in recess for earth electrode as required.	Metre	MR	30000						
19.07	Supplying and laying 50mmX6mm GI strip at 0.5m below ground level as strip earth electrode, including soldering etc. as required.	Metre	MR	500						
19.08	Providing and fixing 50mmX6mm GI strip on surface/on existing cable trench/RCC pipe/GI pipe or in recess for earth electrode as required.	Metre	MR	500						
19.09	Providing and fixing 25mmX5mm Copper strip on surface/on existing cable trench/RCC pipe/GI pipe or in recess for earth electrode as required.	Metre	MR	500						
19.10	Supplying and laying 25mmX5mm Copper strip at 0.5m below ground level as strip earth electrode, including soldering etc. as required.	Metre	MR	500						
19.11	Supplying and laying 50mmX6mm Copper strip at 0.5m below ground level as strip earth electrode, including soldering etc. as required.	Metre	MR	200						
19.12	Providing and fixing 50mmX6mm Copper strip on surface/on existing cable trench/RCC pipe/GI pipe or in recess for earth electrode as required.	Metre	MR	200						
19.13	Providing and fixing 25 mm X 5 mm copper strip in 40 mm dia G.I. pipe from earth electrode including connection with brass nut, bolt, spring, washer excavation and re-filling etc. as required	Metre	MR	200						
19.14	Providing and fixing 25 mm X 5 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.	Metre	MR	2000						
19.15	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.	Metre	MR	30000						
	TOTAL SUBHEAD 19: EARTHING AS MENTIONED ABOVE									
20.00	SUBHEAD 20: LIGHTNING PROTECTION									
	LIGHTNING PROTECTION									
20.01	Supply and installation of one number earth pit with advance maintenance free Earthing System consisting of one Number, CPRI tested copper bonded steel electrode of minimum 19 mm dia (as per IE C62561-2) With a minimum. coating thickness of 250 microns and length of 3 meters. 25 kg/Electrode of earth enhancing compound (tested as per IEC-62561-7) fill the 100mm augered hole surrounding to the electrode , SS Universal Clamp of Size 175X50X3 mm for terminal Connection including Poly Propylene Heavy duty Pit cover including all accessories , excavation of earth, filling with back fill compound, and earth pit marking. The Complete installation shall be as per the drawing, technical specifications and as required	Set	MR	58						
20.02	Providing and fixing of lightning conductor finial, made of 25mm. dia. 300mm., long GI tube, having single prong at top, with 85 mm. dia. 6 mm. thick GI base plate including holes etc. complete as required.	Each	MR	70						
20.03	Providing and fixing GI tape 20mm X 3 mm thick on parapet or surface of wall for lightning conductor as required. (For horizontal runs).	Metre	MR	3000						
20.04	Providing and fixing GI tape 20mm X 3 mm thick on parapet or surface of wall for lightning conductor as required. (For vertical runs).	Metre	MR	1800						

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
20.05	Providing and fixing testing joint, made of 20mmX3mm thick GI strip, 125 mm. long, with 4 no.'s of GI bolts, nuts, check nuts, bar shaddles, and spring washers etc. complete as required.	Each	MR	58						
20.06	Providing and laying GI tape, 32 mm X 6 mm thick, from test joint upto earth electrode directly in ground as required.	Metre	MR	1400						
	TOTAL SUBHEAD 21: LIGHTNING PROTECTION AS MENTIONED ABOVE									
21.00	SUBHEAD 21: AUDIO VISUAL SYSTEM FOR LECTURE ROOMS									
	Audio Visual System for Lecture Rooms and Demoroom and lecture Hall (FOR 6 NOS.)									
1.00	Supply, installation, testing & Comissioning of compact two-way loudspeaker Freq. Response1 (-3 dB):100 Hz - 16 kHz Freq. Range1 (-10 dB):60 Hz - 20 kHz Rotatable Coverage: 90° x 50° Axial Sensitivity1: 95 dB (1 W/1 m) Max.Calculated SPL1: 126 dB Passive Power Handling2: 350 W continuous, 1400 W peak Impedance: 8 ohms (nominal), 6.0 ohms (min.)Make- Bosch / JBL/ Heinrich/ EV	Nos.	MR	24						
2.00	Supply, installation, testing & Comissioning of Powered Mixer ideal for installs with inbuilt Class D amplifier, Max. midband output power, 1 kHz, THD = 1%, dual channel into 4 Ω :2 x 450 W into 8 Ω: 2 x 270 W , also capable of Direct-Drive option for 100V speaker lines. Frequency response, -3 dB, ref. 1 kHz.Any input to any Mixer output 15–22000 Hz.Crosstalk, 1 kHz Amplifier Ch1/Ch2 < -85 dB.5 MIC/LINE input channels with compressor / limiter and talk-over function, 3 Stereo Inputs including Jack, RCA and USB connectors, onboard player for MP3 or WAV audio files, high quality effects section with 32 editable presets, 3 Master outputs with 7-band EQ each and flexible signal routing options, delay line for Master-B (150 msec / 50m), Auxiliaries (FX, AUX) 1 Post, 1 Pre .Input impedances MIC 2 kΩ CD 10 kΩ All other inputs > 15 kΩ, headphones control, LPN speaker processing, , comprehensive protection package, , optional rack mount kit.Make- Bosch / JBL/ Heinrich/ EV	Nos	MR	6						
3.00	Supply, installation, testing & Comissioning of Handheld Wireless Mic with Cardioid polar pattern for transmitter,Dynamic microphone with Neodymium magnet , Receiver frequency response 80Hz-18kHz,Receiver RF sensitivity < 1.0 μV,Receiver Image rejection>55dB,Receiver Dyanmic range >95dB and receiver having 32 channels possible,Receiver S/N ratio >100dB A,distortion <1 % , Transmitter sensitivity - 3.2 mV/Pa,modulation:+/-40kHz R-300HD-A.Make- Bosch / JBL/ Heinrich/ EV	Nos.	MR	6						
4.00	Supply of Wireless Lapel Mic with Cardioid polar pattern for transmitter , Receiver & Transmitter frequency response 100Hz-18kHz or better,Receiver RF sensitivity < 1.0 μV,Receiver Image rejection>55dB,Receiver Dyanmic range >95dB and receiver having 32 channels possible,Receiver S/N ratio >100dB A,distortion <1 % , Transmitter sensitivity - 5.6 mV/Pa,modulation:+/-40kHz R-300-L-A.Make- Bosch / JBL/ Heinrich/ EV	Nos.	MR	6						
5.00	Supply, installation, testing & Comissioning of Freestanding Gooseneck Mic with base for podium having dual condensor back electret microphone element ,Selectable Omnidirectional/ Cardioid/ Supercardioid/ Hyper Cardioid polar pattern,LED status display and with programmable button for Push to Talk or Push to Mute functions having ,frequency response 50Hz-20kHz ,sensitivity 5.5mV/Pa,clipping level >125dB SPL ,output impendence 200 ohm, Dynamic Range > 100 dB. PC Dekstop-18. Make- Bosch / JBL/ Heinrich/ EV	Nos	MR	6						
6.00	Supply, installation, testing & Comissioning of Equipment rack for keeping quoted AV equipment only with Power socket & fan cooling.	Nos.	MR	6						
	CABLE & CONNECTOR									
7.00	Supply, installation, testing & Comissioning of AV connector and AV cables Make- kramer/ Extron/or Equeivalent	Nos.	MR	6						
8.00	Supply, installation, testing & Comissioning of HDMI Cables(20 mtr.) Make- kramer/ Extron/or Equeivalent	Nos.	MR	6						
9.00	Supply, installation, testing & Comissioning of Cables 2x2.5Sqmm	Meter	MR	6000						
	CEILING MOUNTED PROJECTOR FOR LECTURE ROOMS									
10.00	Supply, installation, testing & Comissioning of 5000 ANSI lumens high brightness,WUXGA resolution (1920X1200) Full HD with VGA, HDMI, video inputs VPLCH375.Make- SONY / BARCO/CHRISTIE	Nos.	MR	6						
11.00	Supply & installation of Ceiling Mounting kit as specified below: Ceiling Mount Kit for Projector Powder coated, easy adjustment	Nos.	MR	6						

S.No.		Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
12.00		Supply, installation, testing & Commissioning of Motorized Screen as specified below: Universal mounting brackets for easy installation anywhere The pentagonal-shaped steel case should have scratch-resistant white polyester finish. Screen Surface: Matt white Aspect Ratio 16:10 Motorised screen Smooth operation Diagonal Size: 123 " or 6X8 Approx.Make- Draper/ Libirty or equivalent.	Nos.	MR	6						
13.00		Supply, Installation, Testing and Commissioning of 2 KVA UPS On Line With 30 minute Backup complete in all respect up to entire satisfaction Engineer in charge of works.	Nos.	MR	6						
TOTAL SUBHEAD 21: AUDIO VISUAL SYSTEM FOR LECTURE ROOMS AS MENTIONED ABOVE											
SUB HEAD 22: LIGHTING CONTROL SYSTEM											
LIGHTING CONTROL SYSTEM											
22.01		Supply, Installation, Testing & Commissioning of DALI Controller. Every Loop will control 64 Lights/ DALI Ballast and controller will control 64 Lights/ DALI Ballast.	Nos.	MR	6						
22.02		Supply, Installation, Testing & Commissioning of 6 Button Keypad having inbuilt proximate sensor, pattern lockable with IP22 protection and Multiple settings on one button.	Nos.	MR	12						
22.03		Supply, Installation, Testing & Commissioning of communication module for Keypad.	Nos.	MR	12						
22.04		Supply, Installation, Testing & Commissioning of 360 degree Ceiling recess mountable 360 degree multifunction sensor that combines motion detection (PIR), Infrared remote control reception (IR) and ambient light level detection (PE) into one device.	Nos.	MR	60						
22.05		Supply, Installation, Testing & Commissioning of System Power Supply to boost the system power.	Nos.	MR	6						
22.06		Supply, Installation, Testing & Commissioning of Network Gateway to extend the network.	Nos.	MR	6						
22.07		Supply, Installation, Testing & Commissioning of Standalone Ceiling Mounted Motion PIR sensor 360 degree.	Nos.	MR	100						
22.08		Supply, Installation, Testing & Commissioning of Standalone Wall Mounted Motion PIR sensor 90 degree.	Nos.	MR	100						
22.09		Supplying and fixing of Panel for Automation with Incoming Protection MCB 3P & Surge Arrestor and Outgoing MCB protection.	Nos.	MR	6						
22.11		Supplying and Fixing of Mounting Box for Keypad	Nos.	MR	12						
22.12		Supplying and Laying of DALI Wire 2 x 1.5 sqmm	Nos.	MR	1400						
TOTAL SUB HEAD 22: LIGHTING CONTROL SYSTEM AS MENTIONED ABOVE											
23.00		SUBHEAD 23: ACCESS CONTROL SYSTEM									
A		ACCESS CONTROL SYSTEM									
1		Supply, Installation , Testing and Commissioning of Micro processor based access control system engineered with 32 bit CPU to cater to the multiple Readers and Multiple locations , Expandable, Networkable . TCP/IP protocol compatible distributed Intelligence, Supporting Two Readers, and having flash memory , can be expandable card data base upto 55000 cards and transaction buffer of 45000 transaction, 128 access level , 127 time zone Levels, 8 supervised inputs and 4 Nos of relay outputs for easy and reliable interface with the 3rd party systems. Complete with Digital Power supply etc as required.	Nos.	MR	3						
2		Supply, Installation , Testing and Commissioning of Single- User Software Platform pioneer in integrating Video, access control and Intrusion detection Systems.The Software is capable of managing the users from multiple locations,Real time event / alarm Monitoring, Schedule Guard Tour feature , Model: Win Pack.	Nos.	MR	1						
3		Supply, Installation , Testing and Commissioning of PC I-5 with DVD Drive and 1 TB HDD, 22" LED Monitor and required Keyboard, Adapter for Ethernet networking ,compatible with TCP/IP network protocols with a minimum bandwidth of 100Mbps along with Microsoft latest Windows software OS complete in all respects as per specifications.	set	MR	1						
i		4 Gigabyte of RAM memory									
ii		1 TB Gigabytes of hard disk space									
iii		DVD Combo Drive									
iv		22" LCD colour monitor									
vi		Optical Mouse with 2 Mouse Pads									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
vii	Multimedia Keyboard									
viii	10/100/ 1000 MBPS PCI LAN onboard card.									
4	Supply, Installation , Testing and Commissioning of standard Range Proximity Reader suitable for external / Internal environment complete as required.	Nos	MR	6						
5	Supply, Installation , Testing and Commissioning of HID 34-bit Proximity Access Card. Standard HID proximity card with slot hole punch on the short side for badge clips (BC-1).	Nos	MR	100						
6	Supply, Installation , Testing and Commissioning of Single Leaf Electromagnetic lock 600LBS with LED and NO/NC Contact with U & L Bracket complete as required.	Nos	MR	1						
7	Supply, Installation , Testing and Commissioning of Double Leaf Electromagnetic lock 600LBS with LED and NO/NC Contact with U & L Bracket complete as required.	Nos	MR	6						
8	Supply, Installation , Testing and Commissioning of egress switch with Metal Plate complete as required.	Nos	MR	3						
9	Supply, Laying , Testing and Commissioning of multistand copper conductor PVC sheathed & shielded Cable 8Cx0.5sqmm dia meter complete as required.	Meter	MR	400						
11	Supply, Installation , Testing and Commissioning of 2 x 1.5 sq. mm dia meter ,copper conductor PVC insulated cable complete in existing Conduit as require	Meter	MR	200						
12	Supply, Installation , Testing and Commissioning of Connectors, interfaces, Mounting hardware, Cords, Jacks, Plugs,tags, identifiers, fixures, clamps, screws, nut - bolts etc as required for the installation and commissioning	set	MR	1						
B	BOOM BARRIER SYSTEM									
1	Supply, installation, testing and commissioning of automatic boom barrier suitable for 5.0m-7.5m road width forintensive applications, high speed with 4.5 second opening time with Straight aluminium boom of minimum size 100mm x 70 mm, builtin blinker indicator etc. complete asrequired as per specifications & at site of work.	Set	MR	5						
2	Supply, installation, testing and commissioning of a set of Entry/ Exit push buttons for manual open and closing of barrier etc.complete as required.	Set	MR	5						
	TOTAL SUB HEAD 23: ACCESS CONTROL AND BOOM BARRIER SYSTEM as Mention Above									
	SUBHEAD 24: OUT DOOR LIGHTING									
24.00	OUT DOOR LIGHTING									
24.01	Supply, erection, testing and commissioning of external swaged steel tubular pole with following specifications & items :									
i	9.0 Mtrs. high swaged steel tubular pole with arm length around 1.5 Metre, the construction of the pole shall be as per IS:2713 - 1980 410 SP-30 with base plate 450mmX450mmX6mm complete as per requirement with two coats of spray paints of approved shade.									
ii	90 watts LED street light fixture in die cast aluminum body with 90 watts LED lamp complete with control gear, cover etc. similar to Compton Greeves LSTN-90-CDL-A or approved equivalent including its wiring with 2X2.5 sq.mm. PVC insulated, FRLS copper conductor and 1.5 sqmm PVC insulated, FRLS copper earth wire from control box complete as required.									
iii	Suitable size 32 A DP MS Control box with 2 no. incoming and outgoing terminals and 2 nos. tap-out terminal with 6A DP MCB complete as required - 1 Set									
iv	Suitable number(s) 40mm dia Class-B GI Pipe(s) from above control box to upto 0.5 metre below ground level for power cable entry									
v	Providing foundation including excavation, shuttering, alignment of poles, casting etc. including lean concrete at the bottom as per CPWD/ BIS specifications.									
vi	The above installations shall be completed as CPWD specifications and as required									
a.	Steet Tubular Poles(9M) Single Arm as mention above	Set	MR	230						
b.	Steet Tubular Poles (9M) same as above but for Double Arm as mention above	Set	MR	78						
24.02	Supply, installation, testing and commissioning of external post top lantern with following accessories and complete as required :									
i	4m high (3.3m above ground) 80mm dia GI pole as approved, adopting socket at top for fixture mentioned below, base plate 300 x 300 x 6mm and provision for mounting junction box etc. - 1 set.									
ii	1 x 40 LED Post top lantern with 40W LED lamp (Crompton Greeves LPTO-40-CDL or equivalent) and its wiring with 2 x 2.5 sq.mm PVC insulated copper wire and 1.5 sqmm PVC insulated copper earth wire from control box .									
iii	Suitable size 20A DP MS Control box with 2 no. incoming and outgoing terminals and 2 nos. tap-out terminal with 1 nos. 5A HRC fuses complete 1 set.									
iv	Suitable number(s) 40mm dia Class-B GI Pipe(s) from above control box to upto 0.5 metre below ground level for power cable entry									
v	Providing 400x400x1000mm deep 1:3:6 ratio cement concrete including excavation shuttering alignment of poles casting etc. including 100mm thick lean concrete shall be provided at the bottom									

S.No.	Description.	Unit.	Referen ce	Quantity	Supply Rates (without GST)	Supply Amount(With out GST)	GST for Supply (%)	Installation, Testing and Commissioning Rates(without GST)	Installation, Testing and Commissioning Amount(without GST)	GST for I/T/C (%)
	Supply, installation, testing and commissioning of external post top lantern as mentioned above	Set	MR	100						
24.03	Supply, installation, testing and commissioning of Post top lantern 1 x 45 LED Post top lantern with 45W LED lamp (Crompton Greeves LSTP 45-CDL or equivalent) and its wiring with 2 x 2.5 sq.mm PVC insulated copper wire and 1.5 sqmm PVC insulated copper earth wire from control box .	Set	MR	40						
24.04	Supply, installation, testing and commissioning of bollard lamps 1X10watts LED Light Fixture (Crompton Greeves LBSL-1-10-CDL (LIARA) or equivalent) control box - 1 set.	Each	MR	50						
24.05	HIGH MAST LIGHT Supply, Installation , Testing and Commissioning of 20 M High Masts with following: 20 Mrt High mast, material of construction as per IS 5986/ BSEN 10025. Fabricated in two parts of 10.3 metre each with base and top dia 460 mm and 150 mm approx respectively, Cross Section of mast (number of Sides) :20 sided polygon thickness 4 mm and 3 mm of bottom section and top section repectively,Base Plate -dia =670 mmX 32 mm thick, PCD foundation bolt 590 mm, Head Frame & Lantern carriage with 16 nos LED Light fixture as per Crompton Greaves catalogue no. LSFO-C300-CDL-60 with 1X300 W flood light with minimum lumen/lamp 31,000, including its foundation, all accessories like feeder panel , double drum winch, SS wire rope, trailing cable L-stopper, manual operating handle, motor mounting, lighting arresters, junction box, double dome LED aviation light, wiring of all light fixture from junction box , earthing of the pole etc including any other item required for the proper functioning of the high mast complete as per technical specification and as required.	No.s	MR	1						
	Supply, Installation , Testing and Commissioning of 16 M High Masts with following: 16 Mrt High mast, material of construction as per IS 5986/ BSEN 10025. Fabricated in two parts of 8.350 metre each with base and top dia 460 mm and 150 mm approx respectively, Cross Section of mast (number of Sides) :20 sided polygon thickness 4 mm and 3 mm of bottom section and top section repectively,Base Plate -dia =670 mmX 30 mm thick, PCD foundation bolt 590 mm, Head Frame & Lantern carriage with 16 nos LED Light fixture as per Crompton Greaves catalogue no. LSFO-C300-CDL-60 with 1X300 W flood light with minimum lumen/lamp 31,000, including its foundation, all accessories like feeder panel , double drum winch, SS wire rope, trailing cable L-stopper, manual operating handle, motor mounting, lighting arresters, junction box, double dome LED aviation light, wiring of all light fixture from junction box , earthing of the pole etc including any other item required for the proper functioning of the high mast complete as per technical specification and as required.	No.s	MR	1						
24.06	Road Lighting Panel Supply, installation, testing and commissioning of following outdoor type with canopy, IP-54 protected M.V. cubicle type totally enclosed, free standing type, dust, damp and vermin proof, MV Panel, busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, stove enamelled painted and having following incoming and outgoing switchgears complete as required. INCOMER: 100 Amps,415 volts, TP+NL, 35 KA Moulded Case Circuit Breaker with thermal magnetic release having variable current settings . R.Y&B phase indicating lamp (LED type) with 2A control SP MCB ,ON, OFF , TRIP for MCCB Extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers. 1 Set of timer switch & 100A TP contactor with neutral link (for street lights control) . BUSBARS: 300 Amp TPN Aluminium busbars OUTGOING: 30 Nos. 16 Amp 415 volts, DP MCB Feeder Pillar as mention above TOTAL SUB HEAD 24: OUT DOOR LIGHTING as Mention Above	Set	MR	10						
25.00	SUBHEAD 25: SOLAR PHOTVOLTAIC POWER GENERATION SOLAR PHOTVOLTAIC POWER GENERATION Design, Supply, installation, testing and commissioning of following capacity 3 phase 415 V grid interactive roof top solar photovoltaic power generation system including solar inverters (Make: Delta, Solis, Fronius), Data logger compatible to inverter, temperature and irradiance sensor (Make: Mahindra, IMT), AC Disconnecter Board, Cables, interconnections, chemical earthing, GI Strip, Lightning arresters etc. including all items required for its synchronization with grid and its synchronization with grid at LT Panel, complete as required in ready to use condition, liaison with authorities for subsidy, if any is also in the scope.									
25.01	i 50KWp	Set	MR	1						
	ii Extra for Design, Supply, installation, testing and commissioning of space frame (Module Mounting Structure) in M.S. for above 50KWp solar system including all necessary civil works in ready to use condition.	Set	MR	1						
	TOTAL SUB HEAD 25: SOLAR PHOTVOLTAIC POWER GENERATION as Mention Above									

ELECTRICAL WORKS(NON SCHEDULE ITES) FOR CONSTRUCTION OF HOSPITAL AND MEDICAL COLLEGE AT CHANDRAPUR, MAHARASHTRA

S. No.	Item No.from BOQ	Items	Approved Makes
1	1.xx	33kV HT Panel Board	Siemens/L&T/ABB/Schneider
2	1.xx	11 kV HT Panel Board	Siemens/L&T/ABB/Schneider
3	1.xx	33/11kV Transformers	ABB/GE/ Schneider/Alstom
4	1.xx	11/.433kV Transformers	ABB/GE/ Schneider/Alstom
5	1.xx	Busduct	L&T/ABB/Siemens/Schneider/GE/ Legrand/C&S
6	1.xx	Safty Equipments	reputed
7	1.xx	HT Cables	CCI/Universal/Finolex/Rallison
8	1.xx	Cable Trays	CCI/Universal/Finolex/Rallison
9	1.xx	HT APFC Panel	Siemens/L&T/ABB/Schneider
10	2.xx	Mian LT Panels	Siemens/ L&T/ABB/Schneider
11	2.xx	APFC Panels	Siemens/ L&T/ABB/Schneider/EPCOS, Ducati
12	2.xx	AHF	Siemens/ L&T/ABB/Schneider/EPCOS, Ducati
13	2.xx	ACB	L & T 'U' Power(Omega)/ Siemens 3WL/ ABB/ Legrand(DMX)/ Schneider (NW- Master Pact)
14		Moulded Case Circuit Breake	L & T – (D sine/DL) / Siemens-VA/ ABB-TMA/ Schneider – (NSX/NS/CVS) /Legrand-DPX
15	3.xx	DG Sets and Synchronization Panel	Diesel Engine:Cummins/ Caterpillar/MTU/ Perkins- Sterling Alternator:Stamford/AVK/ Leroysoner/ KEC,Synchronization Panel/AMF:OEM of the DG set or Siemens/ L&T/ABB/Schneider
16	3.xx	Under Ground Diesel Tank	
17	4.xx	Rising Mains, Tapoff box and end feed unit	L&T/ABB/Siemens/Schneider/GE/ Legrand/C&S
18	5.xx	MV Panels	Tricolite/Adlec./Sterling & Wilson / Control & Switchgear/Nitya Electro Control Pvt. Ltd./Zeta/SPC Electrotech/Neptune
19	6.xx	UPS	Schneider- MG , APC/ Eaton Power ware/ Emerson
20	8.xx	Socket outlets	Legrand-Myrius or Anti bacterial/L&T Oris/Schneider -Livia / Philips -Sleek
21		Copper conductor PVC insulated wires, Co-axial , Telephone wires & cables	L&T/ Batra Henlay/ Bonton/
22	6.xx	MCB-DBSs	L &T/Hager/Legrand/ Siemens/ Schneider/GE / Philips
23	8.xx	MCCBs in Sheet steel encloser	L &T – (D sine/DL) / Siemens-VA/ ABB-TMA/ Schneider – (NSX/NS/CVS) /Legrand-DPX
24	8.xx	PIR sensors	Philips/ Honeywell/ Schneider/Lutron/Legrand
25	9.xx	Light Fixtures	Philips / GE/ Crompton Greaves
26	9.xx	Ceiling Fan, Exhaust Fan	Crompton Greaves/ Orient/ Usha
27	10.xx	EPABX System	Avaya/ Siemens-unify/Alcatel/Cisco
28	10.xx	Telephone Handsets	Avaya/ Siemens-unify/Alcatel/Cisco
29	13.xx	Addressable fire alarm system & Annunciators	Honeywell-Notifier/Edward/Bosch/ Siemens
30	14.xx	Outdoor PA system	Bosch/ Bose/ Honey well /Harman
31	15.xx	CCTV System	Pelco /Bosch/Sony/Axis
32	15.xx	LCD/LED Monitor	Sony/Panasonic/Samsung/ Toshiba
33	16.xx	Nurse Call Bell System	Honeywell/Schreak/ Rauland/Omnitech/Daksh
34	17.xx	Lifts	Otis /Kone/ Mitsubishi/ Scheindler/Johnson
35	18.xx	LT Cables	CCI/Universal/Finolex/Rallison
36	19.xx	Chemical Earthing	OBO Bettermann / Erico/Furse / Ingesco
37	21.xx	Audio Visual System	AV:Make- Bosch / JBL/ EV, Projector:Make- SONY / BARCO//CHRISTIE
38	22.xx	Lighting Control System	Lutron/ Philips/ ABB/ Schneider/ Legrand
39	23.xx	Access Control System	Honeywell-Pro-3000/Schneider/Lenel/Cardex
40	24.xx	Outdoor Lighting Poles	Philips / GE/ Crompton Greaves
41	25.xx	Solar Photovoltaic Power Generation	TATA Power Solar, CEL, BHEL, BEL

COST ESTIMATE OF HVAC WORKS (NDSR Items) FOR "HOSPITAL & MEDICAL COLLEGE" at CHANDRAPUR (MAHARASHTRA)										
Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Supply			Installation, Testing & Commissioning		
					Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/I/C Excluding GST (Rs.) 10	Rate of GST For I/I/ C (%) 11
The prices are to be quoted in the below mentioned form and shall include the supply, installation, testing & commissioning at site of all the equipments, ancillary materials as specified and all such items what so ever which may be required to fulfill the intent and purpose as laid down in the specifications.										
Note:	All Equipment shall be BMS Compatiable with BACnet / MODbus protocol									
A)	<u>EQUIPMENTS</u>									
1.0	WATER CHILING UNITS.									
1.1	Supply, Installation, Testing and Commissioning of water cooled centrifugal type Water chiller machines (ARI Certified) each having a capacity of 1000 TR (actual) at chilled water inlet/outlet temperature of 54°F /44°F with chilled water circulation rate of 2400 USGPM and condenser water inlet/outlet temprature of 88°F /98°F with circulation rate of 3000 USGPM , suitable for operation on refrigerant R134a each comprising of the following complete as per specification and as required.									
	a. 1 No.- centrifugal type compressor hermatic / semi hermatic / open, single/multistage type, automatic capacity control, safety switches, speed increasing gears, forced feed lubrication system etc. as per specifications. The compressor shall have mechanism for stable operation at part loads .									
	b. 1 No.- Suitable capacity squirrel cage induction motor (as per design of chiller manufacturer) suitable for operation on 415±10% volts, 50 Hz A.C. supply.									
	c. 1 No. factory fitted (unit mounted or separate as per std design of Chiller manufacturer) variable frequency drive with active harmonic filters to limit THDi to 5% at equipment level and suitable for compressor motor complete with ammeter with CTs, overload protection ,under voltage protection, protection against phase reversal & independent single phase preventers etc complete as required.									

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		VFD shall be the same make and model which will be used for the testing at manufacturer's works for the AHRI certification. The power and control wiring of the VFD starter to chiller shall be done by the manufacturer.								
		Necessary drive arrangement.								
		d. 1 Set- Lubrication Device consisting of automatic electric oil pump, oil cooler, head tank, oil strainer, automatic oil pressure regulating valve, oil heater, oil heater thermal switch etc. and related controls.								
		e. 1 No.- ASME stamped matching shell and tube water cooled condenser of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 8 m water head.								
		f. 1 No.- ASME stamped matching shell and tube flooded type chiller of M.S. shell and integrally finned copper tubes with marine boxes. Maximum head loss 5 m water head.								
		g. 1 Lot- refrigerant piping fittings, valve and accessories to inter connect compressor, condenser, chiller and expansion valve.								
		h. 1 Set- Advanced Microprocessor based control panel with automatic controls, coloured & graphical display, complete with accessories as per specifications.								
		i. Lot- Refrigerant line accessories comprising of safety valves, angle valve, liquid line indications, liquid level controls etc.								
		j. Lot- water flow switches at inlet and outlet of condenser & chiller, water drain and air purge valves wherever required.								
		k. Lot- Thermal insulation on machine as required.								
		l. Lot- Victaulic coupling at the inlet and outlet piping connections of evaporator and condenser of chillers with vibration isolations.								
		m. Lot- Frame work for mounting the above condenser, chiller, compressor and motor with base plate complete with anti vibration pads/ springs.								
		n. Lot-Initial/first charge of refrigerant gas and compressor oil.								
		o. Necessary spring isolators with 25 mm deflection from OEM for the chilling unit.								
		p. Microprocessor based control panel complete with accessories as per specifications and BMS compatible BACNET/MODBUS Protocol with BMS cards.								
		q. Suitable RCC/Cement concrete foundation for the chilling units installation complete as required. As per the manufacturer drawing.								
		r. The Minimum COP of 6.5 and IPLV \geq 9.25 at ARI conditions should be complied . NPLV less than 0.37.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		s. The IKW/TR should be less than 0.64 (inclusive of all losses) at duty conditions.								
		t. Chilling machines shall be tested as per conditions stipulated in tender for points 25%, 50%, 75% and 100% and test report shall be submitted.								
		u. Automatic tube cleaning system designed for automatic continuous cleaning of heat exchangers with injector,ball trap,drain valves,injection valves, manual ball valves, check valve,drain valve etc.								
		Chiller Fouling Factor : 0.0005 (FPS Unit)								
		Condenser Fouling Factor : 0.001 (FPS Unit)								
		Complete water chilling machine as above.(3W+1S)	4	Nos						
1.2		<u>Plant Room Manager cum Optimiser</u>								
		Plant room manager shall be of same make as chiller.Plant Room Manager for sequencing, remote monitoring, controlling and report generation of all equipments in AC plant room/high side. Selected controller shall have capability to meet detailed IO summary mentioned under specifications. Supervisory controller for management level interface in MS Enclosure SWG thickness, powder coated Siemens grey for Supervisory Controller, IO Cards (with accessories like Transformer, MCBs, internal wiring and Relays with bases). Workstation PC i5 computer 3000 Mhz with 1 TB hard disk, 21" TFT monitor, 104 windows key board, mouse,serial and parallel ports with laser colour printer. This must have software integration on chillers with 3rd party interface available on BACNET including cabling & conduit work as required with card.								
1.2.1		For Plant Room	1	Lot						
2.0		WATER CIRCULATION PUMPS								
2.1		Primary Chilled Water Pumps								
		Supply, installation, testing and commissioning of split casing end suction type centrifugal chilled water pump sets factory assembled and tested for rated efficiency mounted on a common base frame etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty. b. Channel base with vibration isolators, coupling, coupling guard etc.								
		c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump. d. 2 Nos.- 150 mm dia dial type pressure gauge e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/ AC power supply. f. Bellows in suction and discharge line for vibration isolation of suitable capacity. g. Suitable RCC/Cement concrete foundation for the pumps installation complete as required. As per the manufacturer drawing. The pump characteristic shall be as follows:								
2.1.1		Water flow rate=2400 USGPM Head = 15 Metre WC								
		Primary chilled water pumps as described above. (3W+1S)	4	Nos						
2.2		Secondary Pumps & Variable Speed Pumping System								
		Supply, installation, testing and commissioning of End suction, vertical split casing/ vertical inline type centrifugal chilled water recirculation pumps mounted on a common base etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments. The entire system along with the pumps must be sourced from single manufacturer/supplier only, for unit responsibility. The system shall be complete in all respects and suitable for the ratings for each zone/area as indicated.								
		a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty. b. Channel base with vibration isolators, coupling, coupling guard etc.								
		c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump. d. 2 Nos.- 150 mm dia dial type pressure gauge e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/ AC power supply.								

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		f. 1 No. dedicated microprocessor based pump logic controller for each set of pumps with parallel pumping software duly down loaded and capable of controlling upto 4 pumps in parallel / accepting 2 analog input from zone sensor and should be capable of communicating with Building Management System by both hardware and software integration.The price shall include control software and networking hardware and software for integration and compatibility with BMS (BACNET Protocol) from the pump supplier.								
		g. All pumps to be provided with seperate VFD's (variable frequency drives). Separate control panel for each zone/set. Panel should also consist of cooling fan.								
		h. Suitable no. electronic Differential Pressure Transmitters and separate PLC s for each sets..								
		i. The cost will include making necessary flanged suction and delivery headers in C-Class MS								
		j. Suitable RCC/Cement concrete foundation for the pumps installation complete as required, as per the manufacturer drawing.								
		k.Bellows in suction and discharge line for vibration isolation of suitable capacity.								
		l. Complete set system to be mounted on a common MS base frame and shall follow following duty. The pump characteristic shall be as follows:								
2.2.1		Zone-1 Hospital building 2100 USGPM(For Hospital - A block) Head = 28 Metre WC								
		Secondary chilled water pumps as described above. (3W+1S)	4	Nos						
2.2.2		Zone-2 Institutinal buildings 1250 USGPM (For Insitutional blocks) Head = 26 Metre WC								
		Secondary chilled water pumps as described above. (2W+1S)	3	Nos						
2.2.3		300 USGPM (for hospital block) Head = 24 Metre WC								
		Hot water pumps as described above. (2W+1S)	3	Nos						

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2.3		Tertiary chilled water variable speed pumping system								
		Supply, installation, testing and commissioning of Tertiary chilled water variable speed pumping system for various zones. Each zone comprising the following and complete as per specifications. Tertiary bridge shall include a dedicated Tertiary controller capable of accepting input signals from temperature sensors (supply & return temp), multiple temperature, electric/pneumatic transducers for electrically actuated control valve as per the site requirement.								
		The entire system along with the pumps must be sourced from single manufacturer/supplier only, for unit responsibility. The system shall be complete in all respects and suitable for the ratings for each zone/area as indicated.								
		Supply, installation, testing and commissioning of End suction, vertical split casing/ vertical inline type centrifugal chilled water recirculation pumps mounted on a common base etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments.								
		a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty.								
		b. Channel base with vibration isolators, coupling, coupling guard etc.								
		c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump.								
		d. 2 Nos.- 150 mm dia dial type pressure gauge								
		e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/ AC power supply.								
		f. 1 No. dedicated microprocessor based pump logic controller for each set of pumps with parallel pumping software duly down loaded and capable of controlling upto 5 pumps in parallel / accepting 2 analog input from zone sensors and should be capable of communicating with Building Management System by both hardware and software integration. The price shall include control software and networking hardware and software for integration and compatibility with BMS (BACNET Protocol) from the pump supplier.								

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		g. All pumps to be provided with separate VFD's (variable frequency drives). Separate control panel for each zone/set. Panel should also consist of cooling fan.								
		h. Suitable no. electronic Differential Pressure Transmitters and separate PLC s for each sets..								
		i. The cost will include making necessary flanged suction and delivery headers in C-Class MS								
		j. Suitable RCC/Cement concrete foundation for the pumps installation complete as required, as per the manufacturer drawing.								
		k. Bellows in suction and discharge line for vibration isolation of suitable capacity.								
		l. Complete set system to be mounted on a common MS base frame and shall follow following duty.								
		The pump characteristic shall be as follows:								
2.3.1		Medical college building 450 USGPM Head = 18 Metre WC								
		Tertiary chilled water pumps as described above. (1W+1S)	2	Nos						
2.3.2		Admin & Library building 550 USGPM Head = 12 Metre WC								
		Tertiary chilled water pumps as described above. (1W+1S)	2	Nos						
2.3.3		Medical Lab 750 USGPM Head = 22 Metre WC								
		Tertiary chilled water pumps as described above. (2W+1S)	3	Nos						
2.4		Condenser water Pumps Supply, installation, testing and commissioning of end suction back pull out type vertical split casing centrifugal pump sets factory assembled and tested for rated efficiency mounted on a common base frame etc each capable of delivering specified flow rate complete with following as per specifications & schedule of equipments.								

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		a. Pump with IP 55 TEFC induction motor with class F insulation, IE-3 efficiency class and continuous duty. b. Channel base with vibration isolators, coupling, coupling guard etc.								
		c. Cladded insulation and anti corrosive coating inside and outside casing etc. of chilled water pump. d. 2 Nos.- 150 mm dia dial type pressure gauge e. Pumps shall be suitable for operation on 415+/- 10% Volts/ 3ph / 50 Hz/ AC power supply. f. Bellows in suction and discharge line for vibration isolation of suitable capacity. g. Suitable RCC/Cement concrete foundation for the pumps installation complete as required. As per the manufacturer drawing. The pump characteristic shall be as follows:								
2.4.1		Water flow rate=3000 USGPM Head = 24 Metre WC Condenser water pumps as described above. (3W+1S)	4	Nos.						
3.0		COOLING TOWER (CTI Certified low noise model) Supply, installation, testing and commissioning of induced draft FRP type cooling towers for air conditioning system. Each tower shall be complete with distribution system, filling, louvers, steel ladder, fan , motor , VFD and VFD controller for each fans. Motor shall be IP 55 suitable for outdoor installation, 415±10% volts, 50 Hz, 3 phase power supply, IE-3 and insulation calss F. Isolator enclosed in weather proof panel complete with earthing shall be included. Tower shall be selected on basis of water temperature 98 -88 degree F, ambient wet bulb 81 deg F. Cooling tower shall be compatible for working with BMS. Capacity shall be as follows:- Suitable RCC/Cement concrete foundation for the Cooling tower installation complete as required. As per the manufacturer drawing.								
3.1		Water flow rate=3000 usgpm (min 02 cells in each) Cooling Tower as described above. (3W+1S)	4	Nos.						
4.0	NDSR	Hot Water Generator								

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		Supply, installation, testing & commissioning of Electric Hot Water Generator for winter heating/monsoon reheating system. Hot water generator shall be complete with controls, sensors, control cabling ,piping and fittings, thermal insulation, base frame etc. as per specifications. Hot water generator shall be compatible for working with BMS including BMS cards.								
		Suitable RCC/Cement concrete foundation for the Cooling tower installation complete as required. As per the manufacturer drawing.								
4.1		For Monsoon Reheat hospital block Capacity : 150 KW								
		Status : (2W+1S)	3	Nos.						
5.0		AIR HANDLING UNITS								
5.1		Supply, installation, testing and commissioning of sectional construction draw through type Air Handling Units (double skin type) of horizontal /2-tier as specified & shown in schedule of equipment complete with the following :-								
		a. Fan Section and canvas connection, Mixing Box, Thermal break profile. (double skin type)								
		b. Centrifugal blower backward curved, direct/belt driven .								
		c. Coil section with AHRI/Eurovent certified cooling coil, heating coils as per specifications, minimum 2 bend PVC eliminators.								
		d. Pre filters with filter section in all AHUs.								
		e. Fine and hepa filters with filter section wherever specifically specified as per AHU schedule .Wherever fine/hepa filters are specified, item shall include factory fabricated double skin section of same specifications as AHU panels and complete with filter frameworks.								
		f. Drain pan, drain connection.								
		g. Squirrel cage induction IP 55 TEFC , Insulation class 'F', Duty S1 , IE-3 drive motor, drive arrangement, guard etc.								
		h. Necessary vibration isolators & supporting arrangement.								
		i. Fresh air intake arrangement, necessary water drain & air purge valves wherever required etc.								
		j. Canvass connections, necessary foundations, 2 nos pressure gauge, 2 nos thermometer etc								

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		k. Controls for AHUs comprising of a set of PN-16 rating 2 Way pressure independent dynamic balancing cum control valve of required size fitted with modulating actuators having manual override facility on each AHU alongwith wiring for interconnections with 1.5 sq. mm Cu Conductor multicore armoured complete as required. The actuator shall have required shut off capability of minimum 4 bar rating. The acuator shall be compatible with BMS.The valve actuator shall be capable of accepting 2-10 volt DC, 4-20 mA electric signal and shall provide similar transduced feedback output signal to control system.								
		l. Pre Filter : 90% down to 10 micron(MERV-7), Fine filter : 99% down to 3 micron (MERV-14), HEPA filter 99.97% down to 0.3 micron (MERV-17).								
		m. All the AHU's shall be with IP-54 rated suitable capacity VFD starter and isolator switch. The VFDs shall be UL listed with THDi less than 5%. On/Off/trip/run/standby/fault/trip display. O/L, S/C and single phase protection. Interlocking with FDA system for tripping. BMS compatible.								
		<u>HOSPITAL- BASEMENT FLOOR</u>								
5.1.1		H-BF-01 - 2600 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
		<u>HOSPITAL- GROUND FLOOR</u>								
5.1.2		H-GF-01 - 11500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.3		H-GF- 02 - 10500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.4		H-GF-03 - 22500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.5		H-GF-04 - 11000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.6		H-GF-05 - 13000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						

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5.1.7		H-GF-06 -12500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.8		H-GF-07 - 9000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.9		H-GF-08 -15000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.10		H-GF-09 -21000 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
		<u>HOSPITAL- FIRST FLOOR</u>								
5.1.11		H-1F-01 - 13000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.12		H-1F-02 - 13000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.13		H-1F-03 - 12500 cfm/6RD Cooling Coil/1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.14		H-1F-04 - 13000 cfm/6RD Cooling Coil/1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.15		H-1F-05 - 13000 cfm/6RD Cooling Coil/1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.16		H-1F-06 -12500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.17		H-1F-07 - 13000 cfm/6RD Cooling Coil/1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.18		H-1F-08 -9000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.19		H-1F-09 -13000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.20		H-1F-10 -12500 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
		<u>Hospital second floor</u>								
5.1.21		H-2F-01 -11000 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.22		H-2F-02 - 10000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre filter)	1	Nos.						

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5.1.23		H-2F-03- 9000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre filter)	1	Nos.						
5.1.24		H-2F-04 -15000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.25		H-2F-05 -13500 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.26		H-2F-06- 19500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre filter)	1	Nos.						
5.1.27		H-2F-07 -9000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.28		H-2F-08 -7000 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.29		H-2F-09 -18500 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
		<u>Hospital third floor</u>								
5.1.30		H-3F-01 -9000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.31		H-3F-02 -15000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.32		H-3F-03 -8000 cfm/ 6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.33		H-3F-04 - 13500 cfm/6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.34		H-3F-05 - 13000 cfm/6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.35		H-3F-06 - 12500 cfm/6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.36		H-3F-07 - 21500 cfm/6RD Cooling Coil/ 1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
		<u>Hospital fourth floor</u>								
5.1.37		H-4F-01, 4F-07- 11000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	2	Nos.						

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5.1.38		H-4F-02, 4F-06 - 10000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	2	Nos.						
5.1.39		H-4F-03, 4F-08 - 12500 cfm/6RD Cooling Coil/1RD Heating coil/80 mm static (with pre & fine filter)	2	Nos.						
5.1.40		H-4F-04 - 13500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.41		H-4F-05 - 16000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
		<u>Hospital fifth floor</u>								
5.1.42		H-5F-01, 5F-03 - 11000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	2	Nos.						
5.1.43		H-5F-02, 5F-04 , 5F-06, 5F-08 - 10000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	4	Nos.						
5.1.44		H-5F-05 -12500 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.45		H-5F-07 -13500 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
5.1.46		H-5F-09 - 13000 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	1	Nos.						
5.1.47		H-5F-10 - 10500 cfm/ 6RD Cooling Coil/1RD Heating coil /80 mm static (with pre & fine filter)	1	Nos.						
		<u>Hospital Sixth floor</u>								
5.1.48		H-6F-01, 6F-03 - 10500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	2	Nos.						
5.1.49		H-6F-02,6F-04, 6F-06, 6F-08, 6F-10 - 9500 cfm/6RD Cooling Coil/ 1RD Heating coil/80 mm static (with pre & fine filter)	5	Nos.						
5.1.50		H-6F-05, 6F-09 -12000 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	2	Nos.						
5.1.51		H-6F-07 -13000 cfm/ 6RD Cooling Coil/1RD Heating coil/ 80 mm static (with pre & fine filter)	1	Nos.						
		<u>Medical College</u>								

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5.1.52		MC-GF-01- 12000 cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	1	Nos.						
5.1.53		MC-1F-01,4F-01- 13000 cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	2	Nos.						
5.1.54		MC-2F-01,3F-01- 12500 cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	2	Nos.						
		<u>Admin & Library Block</u>								
5.1.55		LBAD-GF-01 - 7500cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	1	Nos.						
5.1.56		LBAD-GF-02 - 9500cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	1	Nos.						
5.1.57		LBAD-1F-01 - 8500cfm/ 6RD Cooling Coil/80 mm static (with pre & Fine filter)	1	Nos.						
5.1.58		LB-1F-02 - 11000cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	1	Nos.						
5.1.59		LBAD-1F-03 - 12000cfm/ 6RD Cooling Coil/80 mm static (with pre filter)	1	Nos.						
5.1.60		LBAD-2F-01 - 15500cfm/ 6RD Cooling Coil/ 80 mm static (with pre & Fine filter)	1	Nos.						
		<u>Medical Lab</u>								
5.1.61		ML-GF-01, 4F-01 - 11000cfm/ 6RD Cooling Coil/ 80 mm static (with pre and fine filter)	2	Nos.						
5.1.62		ML-1F-01, 3F-01, 5F-01 - 12000cfm/ 6RD Cooling Coil/ 80 mm static (with pre and fine filter)	3	Nos.						
5.1.63		ML-1F-02, 3F-02 - 8500cfm/ 6RD Cooling Coil/ 80 mm static (with pre and fine filter)	2	Nos.						
5.1.64		ML-2F-01 - 8000cfm/ 6RD Cooling Coil/ 80 mm static (with pre and fine filter)	1	Nos.						
5.1.65		ML-5F-02 - 7500cfm/ 6RD Cooling Coil/ 80 mm static (with pre and fine filter)	1	Nos.						
5.2		OT AHUs								

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		<p>Supply, installation, testing and commissioning of sheet metal sectionalised construction draw thru type in double skin construction. Each Air Handling Units shall be with pre filter section with prefilters, mixing chamber, minimum 2 bend PVC eliminators, chilled water cooling coil, hot water coil (AHRI/ Eurovent) certified of copper tube & Al fins construction, squirrel cage induction motor with VFD starters(IP-54) mounted on AHU for supply and return air fans, motor efficiency class IE-3 suitable for 415+/- 10% V, 50 Hz 3 Phase AC supply suitably designed for variable frequency drives. Backward curved plug type direct driven supply air and return air fans. fine filters section , suitable pan type humidifier with humidifier section, suitable vibration isolation arrangement. Coil size shall be selected for a maximum face velocity of 500 FPM and static pressure shall be 135 mm WG .The air moving capacities shall be as detailed below. These units shall be in accordance with drawings and specifications.</p> <p>(The heaters shall be controlled by independent thermostats / humidistats / through electro magnetic type contractors and safety thermostats / geysers as specified complete with wiring for interconnections with 1.5 sq. mm. copper conductor multi core armoured cable.</p> <p>(All these AHUs shall be with thermal break profile and all its fans shall be AMCA certified)</p>								
5.2.1		3000 cfm with 6 row cooling coil/ 1 row heating coil.	9	Nos.						
5.2.2		3500 cfm with 6 row cooling coil/ 1 row heating coil.	1	Nos.						
		(Hepa filters shall be supplied and installed at terminals by OT Vendor, the cost of these HEPA filters not to include in AHU cost)								
5.3		CEILING SUSPENDED UNITS								
		Supply, installation, testing and commissioning of draw through type Air Handling Units (double skin type) of ceiling suspended type as specified & shown in schedule of equipment complete with the following :-								
		a. Fan Section and canvas connection, Thermal break profile. (double skin type)								
		b. Centrifugal blower								
		c. Coil as per specifications.								
		d. Pre filters as required								

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		e. Drain pan, drain connection.								
		f. Squirrel cage induction drive motor IP 55, TEFC , Insulation class 'F', Duty S1, IE-3 drive arrangement, guard etc. All AHU motors shall be compatible for working with VFD.								
		g. Necessary vibration isolators & supporting arrangement.								
		h. Fresh air intake arrangement,necessary water drain & air purge valves wherever required etc.								
		i. Canvass connections,suspension arrangement, 2 nos pressure gauge, 2 nos thermometer etc								
		j. Controls for AHUs comprising of a set of PN-16 rating 2 Way pressure independent dynamic balancing cum control valve of required size fitted with modulating actuators having manual override facility on each AHU alongwith wiring for interconnections with 1.5 sq. mm Cu Conductor multicore armoured complete as required. The actuator shall have required shut off capability of minimum 4 bar rating. The acuator shall be compatible with BMS.The valve actuator shall be capable of accepting 2-10 volt DC, 4-20 mA electric signal and shall provide similar transduced feedback output signal to control system.								
		<u>Hospital Block</u>								
5.3.1		HS -GF-01, GF-02 - 3500cfm/ 4RD Cooling Coil/40 mm static	2	No.						
		<u>Library & Admin Block</u>								
5.3.2		LBAD -GF-01, GF- 03 - 3500cfm/ 4RD Cooling Coil/40 mm static	2	No.						
5.3.3		LBAD -GF-02 - 3000cfm/ 4RD Cooling Coil/40 mm static	1	No.						
		<u>Medical Lab</u>								
5.3.4		ML-CSU -1F-02, 1F-03, 2F-02, 3F-02, 4F-01, 5F-03, 5F-04 - 1500cfm/ 4RD Cooling Coil/40 mm static	7	No.						
5.3.5		ML-CSU -1F-01, 2F-01,2F-03, 3F-01, 3F-03, 5F-01, 5F-02 - 2000cfm/ 4RD Cooling Coil/40 mm static	7	No.						
5.3.6		ML-CSU -GF-01, GF-02, 6F-02, 6F-03 3000cfm/ 4RD Cooling Coil/40 mm static	4	No.						
5.3.7		ML CSU-5F-04, 5F-05, 6F-01, 6F-04 - 3500cfm/ 4RD Cooling Coil/40 mm static	4	No.						

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5.3.8		ML -CSU- GF-03, GF-04, GF-05, GF-06, 1F-04, 1F-05, 2F-04, 2F-05, 3F-04, 3F-05, 4F-02,4F-03, 6F-05, 6F-06 - 4500cfm/ 4RD Cooling Coil/40 mm static	14	No.						
5.3.9		TFA -2000cfm/ 6RD Cooling Coil/80 mm static (with pre & fine filter)	2	No.						
5.4		FAN COIL UNITS								
		Supply, installation, testing and commissioning of horizontal type sheet metal ceiling suspended FCU's each complete with 3 row deep chilled water cooling coil of copper tubes aluminium fins construction, centrifugal fan, 3 speed motor, aluminium cleanable filters insulated condensate drain pan, coil piping connections, condensate drain connection, 2 way motorised cum automatic balancing valves provided with spring return function & fitted with modulating actuators in chilled water lines at each fan coil unit. The actuator shall have required shut off capability of minimum 4 bar rating and should be able to accept 24V power supply.The valves and actuator shall be compatible with BMS complete vibration isolator, wiring complete as required, with ball valve, ball valve with strainer as required as per specification & drawings with the following capacities:-								
5.4.1		1.0 TR	5	No.						
5.4.2		1.5 TR	5	No.						
5.4.3		2.0 TR	8	No.						
5.4.4		2.5 TR	10	No.						
5.5		Ductable Units								
		Supply , installation , testing and commisioning of air cooled Ductable split type unit with scroll compressors suitable for 3 Phase 50 Hz AC supply comprising of the following.								
		a) Outdoor condensing Units								
		b) Indoor Evaporative Units with fine filters.								

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		c) Interconnecting Refrigerant and drain piping with insulation wherever required, refrigerant and oil. The unit shall include refrigerant piping, power cabling, fresh air intake arrangement and drain piping as required.								
		d) Safety and operational controls								
		e) The unit shall have advanced microcomputer controller with run time equalization, auto restart after power failure, fuzzy logic, self fault diagnostics . The controller shall have LED display, LED indicators and touch key pad. The controller shall have faults and alarm display and it shall be mounted in fire retardant box.								
5.5.1		Capacity : 17 TR	2	No.						
5.5.1.1		Extra Refrigerant Piping for 17 TR units	15	Rmt						
5.5.1.2		Extra drain piping	15	Rmt						
5.5.2		Capacity : 11 TR	8	No.						
5.5.2.1		Extra Refrigerant Piping for 11 TR units	30	Rmt						
5.5.2.2		Extra drain piping	30	Rmt						
5.5.3		Capacity : 8.5 TR	1	No.						
5.5.3.1		Extra Refrigerant Piping for 8.5 TR units	8	Rmt						
5.5.3.2		Extra drain piping	8	Rmt						
5.5.4		Capacity : 5.5TR	5	No.						
5.5.4.1		Extra Refrigerant Piping for 5.5 TR units	25	Rmt						
5.5.4.2		Extra drain piping	25	Rmt						
5.6	NDSR	TFA with heat recovery wheel(AHU) - Outdoor floor mounted type								
		Supply, installation, testing & commissioning of double skin floor mounted type, sectionalized construction, draw through type with thermal break design air handling unit (AHU) as per specifications & complete with the following:								
	a	Pre-filter section with MERV-8 filters. (Synthetic fibre pre-filter) (for fresh air & return air)								

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	b	Fine Filter section with MERV-14 filters. (for fresh air)								
	c	Ultra-Violet Germicidal irradiation(UVGI) Rod								
	d	Cooling coil section with 6 Row deep copper tubes & aluminum fins cooling coil.								
	e	Heat Recovery Wheel section with desiccant motor and its geared motor & drive package.								
	f	Supply air Fan section with DIDW Centrifugal fan, AMCA certified backward curved high efficiency fan with fire retardant flexible connection at fan outlet.								
	g	Exhaust air Fan section with DIDW Centrifugal fan, AMCA certified backward curved high efficiency fan with fire retardant flexible connection at fan outlet.								
	h	High efficiency IE 3 squirrel cage induction motors suitable for 415±10% volts, 50±3%Hz, 3 phase AC supply. Motor shall be with suitable capacity IP-55 VFD . It shall be complete with V-Belt drive package.								
	i.	Fan & motors shall be mounted on a common base frame with motor sliding rails & complete base frame mounted on the AHU casing with vibration isolation spring isolators.								
	j	Dampers for fresh air intake, supply air and return/exhaust air (Motorised)								
	k	Controls for AHUs comprising of a set of PN-16 rating 2 Way pressure independent dynamic balancing cum control valve of required size fitted with modulating actuators having manual override facility on each AHU alongwith wiring for interconnections with 1.5 sq. mm Cu Conductor multicore armoured complete as required. The actuator shall have required shut off capability of minimum 4 bar rating. The acuator shall be compatible with BMS.The valve actuator shall be capable of accepting 2-10 volt DC, 4-20 mA electric signal and shall provide similar transduced feedback output signal to control system.								
	l	Unit mounted Electrical Control Panel in IP 55, weather proof design with incomer disconnect switch/MCCB, VFD for supply air fan, exhaust air fan & wheel motor and complete in all respects including safeties, interlocks, metering & indication, fully BMS compatible and as approved.								
		The Unit selection shall be as following :								
5.6.1	NDSR	Type - 1								
		Fresh Air Conditions:								
		Summer								
		Monsoon								

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		112 ⁰ F DB & 18% RH 85 ⁰ F DB & 82% RH								
		Return Air Conditions: 76 ⁰ F DB & 60% RH								
		Supply Air Conditions after cooling coil: 54 ⁰ F DBT & 55° F WBT								
		Supply Air Fan: 12000 CFM 100 mm Wg Total SP								
		Exhaust Air Fan: 10000 CFM 60 mm Wg Total SP								
		TFA cum HRW AHU Units as above.	2	Set						
5.6.2	NDSR	Type - 2								
		Fresh Air Conditions:								
		Summer 112 ⁰ F DB & 18% RH								
		Monsoon 85 ⁰ F DB & 82% RH								
		Return Air Conditions: 76 ⁰ F DB & 60% RH								
		Supply Air Conditions after cooling coil: 54 ⁰ F DBT & 55° F WBT								
		Supply Air Fan: 15000 CFM 100 mm Wg Total SP								
		Exhaust Air Fan: 13000 CFM 60 mm Wg Total SP								
		TFA cum HRW AHU Units as above.	4	Set						
6.0		Ventilation Fan Sections								

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		Supply, installation, testing and commissioning of double skin construction fan sections with canopy suitable for outdoor duty. The unit shall be complete with direct driven plug fans, squirrel cage induction motor IP-55, IE-3 duty S1, vibration isolators, canvass connections, VFD starter , The item shall have pre , fine filters and HEPA as mentioned below.The motor shall be suitable for operation on 3 Phase, 415 +/- 10% V, 50 Hz AC supply.								
		a. Casing (double skin canopy type as AHU specs)								
		b. Centrifugal type Plug fans.								
		c. Charcoal filter and Fine filters as per specifications.								
		d. Pre filters as required								
		e. Necessary foundations etc								
		f. Drive motor, drive arrangement, guard etc.								
		g. Wiring for interconnection with AHU VFD starter with 1.5 sq. mm Cu Conductor multicore armoured complete as required.								
		Location : Terrace								
6.1		EX-1 (Vivarium & Autopsy)								
		Air Quantity : 4500 CFM. (with Pre, fine, hepa)	3	Set						
		Static Pressure :125 mm wg								
7.0		VAV Boxes								
		Pressure independent variable air volume boxes complete with damper, differential pressure sensor, temperaure sensor, thermostat, damper actuator, controller capable of accepting signal from thermostat and output to damper actuator with silencer.VAV boxes shall be factory caliberated, sound level shall not exceed 30 dbA at 1 m. Quoted price shall include motorised damper with actuator, cooling & heating digital thermostat with on-off control, 24 V power supply unit, differential pressure sensor and required electrical/ control wiring to complete the commissioning.VAV boxes shall be suitable for following air flow capacities :-								
7.1		up to 400 cfm	250	Nos.						
7.2		401 cfm to 1000 cfm	180	Nos.						
7.3		1001 cfm to 1500 cfm	50	Nos.						
7.4		1501 cfm to 2000 cfm	25	Nos.						

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7.5		2001 cfm to 3000 cfm	25	Nos.						
7.6		3001 cfm to 4000 cfm	25	Nos.						
8.0		Ventilation Fans								
		Inline Fans								
8.1		Supply, installation, testing and commissioning of Inline Fans as shown in drawings and as per equipment schedule .Each fan shall be complete with centrifugal blowers, totally enclosed fan cooled motor. Fan motor shall be suitable for single phase, 220 +/- 6% V, 50 Hz AC supply. Item shall be complete with starter & cabling.								
		Duty: for Relief Air								
8.1.1		Air Quantity :400 CFM Static Pressure : 20 mm wg	3	Nos.						
8.1.2		Air Quantity :600 CFM Static Pressure : 20 mm wg	18	Nos.						
8.1.3		Air Quantity :650 CFM Static Pressure : 20 mm wg	6	Nos.						
8.1.4		Air Quantity :750 CFM Static Pressure : 20 mm wg	19	Nos.						
8.1.5		Air Quantity :850 CFM Static Pressure : 20 mm wg	14	Nos.						
8.1.6		Air Quantity :1200 CFM Static Pressure : 20 mm wg	5	Nos.						
8.1.7		Air Quantity :1600 CFM Static Pressure : 20 mm wg	6	Nos.						

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8.1.8		Air Quantity :2000 CFM Static Pressure : 20 mm wg	5	Nos.						
8.2		Tube Axial Flow (AMCA Certified) Supply, installation,testing and commisioning of tube axial flow fans as shown in drawings, Each fan shall be direct driven. Fan motor shall be suitable for 3 Phase, 415+/- 10% V, 50Hz AC supply with IP 55 protection, class 'F' insulation and IE-3 efficiency class and suitable for continuous duty. Fan shall be complete with gravity louvers, vibration isolators, safety guards (wire mesh). The efficiency of the fan shall not be less than 70 %. Noise level at 3 m should be below 70 dB(if any acoustic treat ment required shall be done by the equipment supplier.								
8.2.1		Duty: Lift well pressurisation Air Quantity : 6500 CFM Static Pressure : 25 mm wg	2	No.						
8.2.2		Duty: Lift well pressurisation Air Quantity : 7500 CFM Static Pressure : 25 mm wg	16	No.						
8.2.3		Duty: Lift lobby pressurisation Air Quantity : 10500 CFM Static Pressure : 25 mm wg	6	No.						
8.2.4		Duty: Staircase pressurisation Air Quantity : 17000 CFM Static Pressure : 25 mm wg	4	No.						
8.2.5		<u>Duty: Fresh Air Supply-</u> Air Quantity : 4500 CFM, 25 mm st. pr.	6	Nos.						
8.2.6		Air Quantity : 6500 CFM, 25 mm st. pr.	7	Nos.						
8.2.7		Air Quantity : 7500 CFM, 25 mm st. pr.	1	Nos.						

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8.2.8		Air Quantity : 9500 CFM, 25 mm st. pr.	2	Nos.						
8.2.9		Air Quantity : 11000 CFM, 25 mm st. pr.	4	Nos.						
8.2.10		Air Quantity : 11500 CFM, 25 mm st. pr.	3	Nos.						
8.2.11		Air Quantity : 12000 CFM, 25 mm st. pr.	7	Nos.						
8.2.12		Air Quantity : 12500 CFM, 25 mm st. pr.	3	Nos.						
8.2.13		Air Quantity : 13000 CFM, 25 mm st. pr.	18	Nos.						
8.2.14		Air Quantity : 14500 CFM, 25 mm st. pr.	3	Nos.						
8.2.15		Air Quantity : 16500 CFM, 25 mm st. pr.	4	Nos.						
8.2.16		Air Quantity : 18000 CFM, 25 mm st. pr.	3	Nos.						
8.2.17		Air Quantity : 22000 CFM, 25 mm st. pr.	2	Nos.						
8.2.18		Air Quantity : 24000 CFM, 25 mm st. pr.	2	Nos.						
8.3		Tube Axial Fans (Fire rated & AMCA Certified)								

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		Supply, installation,testing and commisioning of tube axial flow fans as shown in drawings, Each fan shall be direct driven. Fan motor shall be suitable for 3 Phase, 415+/- 10% V, 50Hz AC supply with IP 55 protection, class 'H' insulation and IE-3 class. Fan shall be complete with gravity louvers, vibration isolators, safety guards (wire mesh). Fan shall be 250 deg C, 2hrs fire rated.The efficiency of the fan shall not be less than 70 %. Noise level at 3 m should be below 70 dB(if any acoustic treatment required shall be done by the equipment supplier. duty: smoke extraction								
8.3.1		Air Quantity : 4500 CFM, 25 mm st. pr.	6	Nos.						
8.3.2		Air Quantity : 6500 CFM, 25 mm st. pr.	7	Nos.						
8.3.3		Air Quantity : 7500 CFM, 25 mm st. pr.	1	Nos.						
8.3.4		Air Quantity : 9500 CFM, 25 mm st. pr.	2	Nos.						
8.3.5		Air Quantity : 11000 CFM, 25 mm st. pr.	4	Nos.						
8.3.6		Air Quantity : 11500 CFM, 25 mm st. pr.	3	Nos.						
8.3.7		Air Quantity : 12000 CFM, 25 mm st. pr.	7	Nos.						
8.3.8		Air Quantity : 12500 CFM, 25 mm st. pr.	3	Nos.						
8.3.9		Air Quantity : 13000 CFM, 25 mm st. pr.	18	Nos.						
8.3.10		Air Quantity : 14500 CFM, 25 mm st. pr.	3	Nos.						
8.3.11		Air Quantity : 16500 CFM, 25 mm st. pr.	4	Nos.						
8.3.12		Air Quantity : 18000 CFM, 25 mm st. pr.	3	Nos.						

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8.3.13		Air Quantity : 22000 CFM, 25 mm st. pr.	2	Nos.						
8.3.14		Air Quantity : 24000 CFM, 25 mm st. pr.	2	Nos.						
8.4	NDSR	Centrifugal Fans (Cabinet Type)								
		Supply, installation, testing and commissioning of SISW class I CENTRIFUGAL FANS for ventilation system. Each fan shall be complete with TEFC type IP 55, IE-3 motor with class F insulation, belt drive, pulley mounted on motor & fan shaft, belt guard, motor mount, casing and vibration isolators as per specifications and shop drawings. All expose fan shall be powdercoated and covered with GI housing to protect fan and motors from weather. Fan motor shall be suitable for 3 Phase, 415+/- 10% V, 50Hz AC supply . Fan shall be complete with gravity louvers.								
		Duty: Toilet Exhaust at Terrace								
8.4.1		Air Quantity : 3000 CFM Static Pressure : 25 mm wg	2	Nos.						
8.4.2		Air Quantity : 5000 CFM Static Pressure : 25 mm wg	2	Nos.						
8.4.3		Air Quantity : 6500 CFM Static Pressure : 25 mm wg	1	Nos.						
8.4.4		Air Quantity : 8500 CFM Static Pressure : 25 mm wg	1	Nos.						
8.4.5		Air Quantity : 11500 CFM Static Pressure : 25 mm wg	1	Nos.						
		Duty: Laundry and Exhaust								
8.4.6		Air Quantity : 16500 CFM	1	Nos.						

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		Static Pressure : 25 mm wg								
9.0		Air Washer Unit								
		Supply, installation, testing and commissioning of double skin air washer units for air cooling work constructed as per detailed specifications and drawings, complete with 50mm thick prefilter, minimum 200 mm deep celdeck pad, water circulating pump, DIDW centrifugal fan, TEFC squirrel cage IE-3 induction motor V-belt & drive set vibration isolators, internal piping with class 'B' piping, quick fill, make up drain, overflow connection float valve etc. complete with all respects. Mounting frame of angle iron for floor / wall mounting. Price must include starter panel, cabling, control wiring, earthing etc.								
		Duty: Morgue ventilation								
9.1		8000 CFM with 50 mm static pressure	1	No.						
		Duty: kitchen ventilation								
9.2		21000 CFM with 50mm static pressure	1	No.						
		Duty: Laundry								
9.3		16500 CFM with 50 mm static pressure	1	No.						
		Duty: washing cssd ventilation								
9.4		7500 CFM with 50 mm static pressure	1	No.						
10.0		Factory Fabricated Double Skin Scrubber								
		Supply, installation, testing and commissioning of factory fabricated Double Skinned Scrubber unit floor mounted type fabricated out of extruded aluminium section with 0.8mm pre-plasticized /pre-coated Galvanised steel sheet outside & 0.8 mm plain Galvanised steel sheet inside with blower, blower section and blower motor TEFC type suitable for operation on 415 volts ± 10%, 50 Hz ± 5% AC supply, belt drive package, wet section & tank shall be made of 18 G tainless steel. The Scrubber shall be complete with spray arrangement with metallic viscous filter & face velocity across the section shall be limited to 152 MPM.								

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		The scrubber shall have an efficiency of 90% & shall be complete with water circulation pump GI B Class interconnecting piping & valves, viscous filters. The scrubber panels shall be insulated with 23mm thick & 36 Kg/m ³ density PU foam. The scrubber shall conform to specification given in the tender & shall be of following capacity.								
10.1		Scrubber - 25,000 CFM, 65 mm St. Pr.	1	No.						
11.0		Dry Scrubber for Kitchen								
		Supply, instalation, testing and commissioning of Electrostatic Precipitation based Dry Type Scrubber Unit complete with hanging arrangements, supports , hangers etc as per specification and drawings.								
11.1		Dry type scrubber, capacity 1800 CFM, suitable for 220 +/- 10% volts, 50 Cycles, 1 Phase AC Supply 50mm static pressure	1	No.						
12.0		EXPANSION TANK								
		Supply, installation, testing and commissioning of pressurised closed type Expansion tank with air separator and dosing pumps (1w+1s) etc. The expansion tank shall be complete with all necessary valves, vent connection. Quoted price shall include of 50 mm thick 32 kg/mt cu density TF quality Expanded polystyrene insulation and cladded with 26 gauge aluminum sheet for chilled water tank and glass wool insulation as per specifications with 26 gauge aluminium sheet cladding for Hot water tank. Tank shall be equipped with 15 mm dia vent, 450 mm dia manhole with cover, 40 mm dia make up with overflow connection (ball valve should be provided at the make up line), 50 mm dia drain and overflow with necessary valves and 50 mm dia insulated pipe connection to nearest chilled water return line. Complete system shall be from one supplier.								
12.1		8000 ltrs.	1	No.						

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12.2		4000 ltrs.	1	No.						
13.0		MONSOON REHEATING ARRANGEMENT								
13.1		Supply, Installation, testing & Commissioning of monsoon reheating arrangement fixed in ducts/ plenums complete with strip heaters, fixing frame work , insulators, fire protection insulation in duct, controls such as heating thermostats, humidistats etc. The heaters banks shall be controlled by independent thermostats / humidistats / through electro magnetic type contractors and safety thermostats / geysers as specified complete with wiring for interconnections with 1.5 sq. mm. copper conductor multi core armoured cable. The heater capacity shall be as per schedule of equipment and specifications, drawing etc.								
13.1.1		2 KWx 2 banks	6	Nos						
13.1.2		3 KWx 2 banks	10	Nos						
B)		<u>PIPING</u>								
14.0	DSR	CONDENSER WATER PIPING								
16.10		Supplying, fixing, testing and commissioning of condenser water pipes of following sizes of MS 'C' class along with necessary clamps, vibration isolators and fittings such as bends,tees etc.but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specification and as required complete in all respect. Note:-The Pipes size 150mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35mm thick M.S. Sheet for pipes upto 350 mm dia. And from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.								
14.1	NDSR	750 mm dia	20	RM						

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14.2	NDSR	600 mm dia	120	RM						
14.3	NDSR	400 mm dia	30	RM						
14.4	NDSR	350 mm dia	100	RM						
14.11	NDSR	80 mm dia	20	RM						
14.12	NDSR	65 mm dia	20	RM						
14.13	NDSR	50 mm dia	20	RM						
14.14	NDSR	40 mm dia	20	RM						
15.0		VALVES WITHOUT INSULATION								
	16.11	Supplying, fixing, testing and commissioning of following valves, gauges and strainers for condenser water circulation as per specifications.								
15.1	16.11.1	Butterfly valves (manual) : with C I body SS disc nitrile sheet & O - ring & PN 16 pressure rating as specified.								
15.1.1	NDSR	600 mm dia.	5	Nos						
15.1.2	NDSR	350 mm dia.	16	Nos						
15.1.3	NDSR	300 mm dia.	2	Nos						
15.1.4	NDSR	250 mm dia.	3	Nos						
15.3	NDSR	Manual Balancing Valves								
		Balancing valves with buit in measuring facility with C I body flanged construction with EPDM coated disc with long pitch with protected out pipe insulation & PN 16 pressure rating for condenser water circulation as specified.								
15.3.1		350 mm dia (For Condenser & Cooling Tower)	8	Nos						
15.4	16.11.2	Non return/Check valves : with dual plate of CI body SS plates vuicanized NBR seal flanged end & PN 16 pressure rating as specified.								

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15.4.1	NDSR	350 mm dia.	4	Nos						
15.5	NDSR	Pot strainer with drain valve (equivalent SSPL model)								
15.5.1		600 mm dia.	1	Nos						
15.6	NDSR	Y- strainer with drain valve								
15.6.1		350 mm dia.	4	Nos						
15.7	NDSR	Auto Air Vent Valves								
15.7.1		32 mm dia	25	Nos						
15.7.2		40 mm dia	40	Nos						
15.8	NDSR	<u>Suction Guide</u>								
		Providing and fixing of suction guide of following sizes in the inlet of condenser water pumps as per specifications								
15.8.1		350 mm dia.	4	Nos.						
16.0	DSR	INSULATED CHILLED WATER PIPING								

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16.1	16.3	Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping plumbing inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with fire retardant quality expanded polysterene moulded pipe section of density 20 kg/cu.m after a thick coat of cold setting adhesive (CPRX compound) wrapping with 500g polythene faced hessain and finally applying 0.63 aluminium sheet cladding complete with type3, grade 1 roofing feltstrip (as per IS:1322 as amended up to date) at joints repairing of damage to building etc. as per specifications and as required complete in all respect. Note: The Pipes of sizes 150mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.								
16.1.1	NDSR	600 mm dia (100 mm insulation)	140	RM						
16.1.2	NDSR	450 mm dia (100 mm insulation)	120	RM						
16.1.17	NDSR	20 mm dia (50 mm insulation)	80	RM						
16.2	NDSR	PIPING (Burried)								
		Supply, Installation, Testing and Commissioning of following nominal sizes of Chilled water piping Outside the building burried in ground (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges) adequately supported on rigid supports and duly insulated with fire retardant quality expanded polysterene molded pipe sections of specified density after a thick coat of cold setting adhesive (CPRX compound) wrapping with 500 gm polythene faced hessain and secured with 0.5mm x 20mm G.I wire mesh and two coats of cement plaster (each layer not less than 10mm) as per specifications including digging and refilling the trenches and providing suitable thickness 1:2:4 cement concrete pads at 3 m intervals complete as per specifications and as required.								
16.2.1		300 mm dia	1500	RM						

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16.2.2		200 mm dia	200	RM						
16.2.3		150 mm dia	400	RM						
16.2.4		125 mm dia	40	RM						
17.0	DSR	INSULATED VALVES & STRAINERS								
	16.7	Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications.								
17.1	16.7.1	Butterfly valves (Manual) : with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/ hot water circulation as specified								
17.1.1	NDSR	600 mm dia.	2	Nos						
17.1.2	NDSR	450 mm dia.	4	Nos						
17.1.3	NDSR	400 mm dia.	4	Nos						
17.1.4	NDSR	350 mm dia.	6	Nos						
17.1.5	NDSR	300 mm dia.	16	Nos						
17.1.6	NDSR	250 mm dia.	2	Nos						
17.1.15	NDSR	32 mm dia	48	Nos						
17.1.16	NDSR	25 mm dia (ball valve)	36	Nos						
17.1.17	NDSR	20 mm dia (ball valve)	36	Nos						
17.2	NDSR	Motorized Butterfly Valves								
		Providing and fixing the following motorized butterfly valves for chilled water pumps and boiler as per specifications								
17.2.1	NDSR	300 mm dia.	8	Nos.						
17.2.2	NDSR	250 mm dia.	2	Nos.						

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17.2.3	NDSR	200 mm dia.	2	Nos.						
17.2.4	NDSR	150 mm dia.	2	Nos.						
17.2.5	NDSR	125 mm dia.	2	Nos.						
17.3	16.7.2	Balancing valves with buit in measuring facility with C I body flanged construction with EPDM coated disc with long pitch with protected out pipe insulation & PN 16 pressure rating for chilled / hot water circulation as specified.								
17.3.1	NDSR	450 mm dia.	2	Nos						
17.3.2	NDSR	400 mm dia.	2	Nos						
17.3.3	NDSR	300 mm dia.	6	Nos						
17.3.4	NDSR	250 mm dia.	2	Nos						
17.4	16.7.3	Non return/Check valves : with duel plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified.								
17.4.1	NDSR	300 mm dia.	8	Nos						
17.4.2	NDSR	250 mm dia.	2	Nos						
17.5	16.7.4	Y- strainers of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation including insulation as specified.								
17.5.1	NDSR	300 mm dia.	8	Nos						
17.5.2	NDSR	250 mm dia.	1	Nos						
17.5.11	NDSR	32 mm dia	24	Nos						
17.5.12	NDSR	25 mm dia	18	Nos						
17.5.13	NDSR	20 mm dia	18	Nos						
17.6	NDSR	Suction Guide								

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		Providing and fixing of suction guide of following sizes in the inlet of chilled water pumps as per specifications								
17.6.1		300 mm	12	Nos.						
17.6.2		250 mm	2	Nos.						
17.6.3		200 mm	3	Nos.						
17.6.4		150 mm	7	Nos.						
17.6.5		125 mm	3	Nos.						
17.6.6		80 mm	2	Nos.						
17.7	NDSR	Providing and fixing in position the following Gate Valves duly insulated as per specifications:								
17.7.1		50 mm dia Valves	50	Nos.						
17.7.2		40 mm dia Valves	40	Nos.						
17.7.3		32 mm dia Valves	40	Nos.						
17.8	NDSR	Auto Air Vent Valves								
17.8.1		25 mm dia	40	Nos.						
17.8.2		40 mm dia	50	Nos.						
17.9	NDSR	Ball Valve with strainer								
17.9.1		25 mm	14	Nos.						
17.9.2		20 mm	10	Nos.						
17.10	NDSR	Ball valve without strainer								
17.10.1		25 mm	10	Nos.						
17.10.2		20 mm	10	Nos.						
17.11		Supply, installation, testing and commissioning cooling thermostats :-								

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17.11.1		For AHUs, CSUs	130	Nos.						
18.0	NDSR	DRAIN PIPING								
18.1		Supply, laying/fixing, testing and commissioning of G.I. medium class ERW piping conforming to IS:1239 with necessary clamps, supports, anti vibration mountings, hangers and fittings such as bends, tees, reducers etc. duly insulated and painted as per specifications for condensate drain from air handling units and chillers etc.								
18.1.1		80 mm dia	150	RM						
18.1.2		65 mm dia	200	RM						
18.1.3		50 mm dia	250	RM						
18.1.4		40 mm dia	250	RM						
18.1.5		32 mm dia	200	RM						
18.1.6		25 mm dia	100	RM						
C)		<u>AIR DISTRIBUTION</u>								
19.0		DUCTING								
19.2	NDSR	Extra for Fire Resistant Paint over GI ducting								
		Supply and applying fire resistant paint on factory fabricated GSS sheet metal ducting to achieve 2 hrs 250deg fire ratings as per manufacturer standards.								
19.2.1		Fire resistant paint CBRI or equivalent approved .	4000	Sqm.						
19.3	NDSR	ALUMINIUM DUCTING								
		Supply, fabrication, installation and testing of aluminium ducts in accordance with the approved shop floor drawing and specifications. Material should confirm to IS 737 latest edition.								
19.3.1		Thickness 0.80 mm sheet	1000	Sqm.						

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19.3.2		Thickness 1.00 mm sheet	1500	Sqm.						
19.3.3		Thickness 1.5 mm sheet	120	Sqm						
22.0		GRILLES, DIFFUSERS AND DAMPERS								
22.2	NDSR	Supply, installation, testing and balancing of powder coated extruded M.S. Air Grilles with volume control dampers.								
22.2.1		Supply / Exhaust air grilles in double adjustable louvers with volume control dampers.	55	Sqm.						
22.2.2		Painted metal jali with M.S. frames for the duct termination in the blower room.	45	Sqm.						
22.3	NDSR	LINEAR GRILLES								
		Supply, installation,testing and balancing of air linear grilles of powder coated aluminium construction suitable for installation in walls/false ceiling, boxing etc as per specifications and drawings.	200	Sqm.						
22.4	NDSR	FRESH AIR GRILLES with bird screen								
22.4.1		Supply, installation,testing and balancing of extruded aluminium fresh air/ Exhaust air grilles with louvers and bird screen as per specification and drawings.	80	Sqm.						
22.4.2		Supply, installation, testing, commissioning and balancing of fresh air opening comprising of powder coated extruded aluminium louvers with bird screen, projection with frame and volume control damper with lever mounting arrangement etc. as per specifications and drawings.	25	Sqm.						
22.5	NDSR	GRILLE DAMPERS								
22.5.1		Supply, installation and balancing of aluminium construction volume control dampers for linear grills.	80	Sqm.						

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22.6		CEILING DIFFUSERS								
22.6.2	NDSR	Supplying, fixing testing commissioning of supply air Swirl diffusers with adjustable air control blades of powder coated aluminium with volume control damper and UL certified volume flow limiter and plenum	100	Sqm.						
22.6.4	NDSR	SLOT DIFFUSER								
		Supply, installation,testing and balancing of slot diffusers of powder coated extruded aluminium construction suitable for installation in walls/false ceiling, boxing etc as per specifications and drawings, the diffusers shall be with hit and miss damper at the supply air portion as per specification and approved shop drawings.	15	Sqm.						
22.6.5	NDSR	LAMINAR FLOW DIFFUSERS								
		Providing & fixing of 18swg aluminium powder coated non-respiratory 100% air tight laminar flow diffusers. LFDs shall have 50% perrforation.The perforated front face is oenable hinge type complete with key operated opposed blade dampers from front. Size: 1200 x 600	100	Nos.						
22.6.6		Providing & fixing of aluminium powder coated grilles with 60% face area. The grill shall be complete with damper & complete 25 mm thick aluminium filters.	25	Sqm						
23.0	NDSR	Pan type Humidifier								
		Supply, installation, testing and commissioning of electric pan type humidifiers in each Air Handling Rooms to provide humidification during winter months heating operation. The humidifier shall evaporate 12 liters water per hour and complete with all required water valves incoming MCB, humidistat and ,electrical & control wiring and earthing as required.	20	Sets						
24.0	DSR	Duct Insulation and Acoustic lining								

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24.2	NDSR	DUCT INSULATION (out door application)								
		Supplying and fixing of 25 mm thick, 40-60 Kg / M ³ density closed cell elastomeric nitrile rubber class 'O' secured with approved adhesive. The insulation shall be finished with 7 mil woven glass cloth with UV resistant paint. (For Out Door application)	750	Sqm.						
24.3.2	NDSR	Duct Silencer								
		Supply, installation, testing, commissioning and balancing of duct silencer in both supply & return air ducting with heavy gauge GI sheet with acoustic insulation material, inside GI perforated sheet all complete as per specifications & shop drawings etc.	15	Sqm.						
D)	NDSR	<u>ELECTRICAL</u>								
25.0		AIR- CONDITIONING PANELS								
		Supply, installation, testing and commissioning of A/C Panel, Type Tested Assembly (TTA), as per IEC 61439-1&2 cubicle type, totally enclosed, free standing type, dust, damp and vermin proof panel, powder coated, made up of CRCA sheet, complete with aluminum 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. Complete as per technical specifications and as required.								
		Note :								
		i.All ACBs shall have spare contacts								
		ii.All ACBs should have I _{cw} =I _{cs} =I _{cu} =50 KA for 1 sec								
		iii.All MCCBs shall have I _{cs} =I _{cu} =100%								
		iv.Separate fault indication for O/L, S/C, & E/F to be provided on Panel Door for all outgoing having microprocessor based MCCB								
		v.All indication Lamps will be LED Type .								
		vi.All starters shall be provided with digital ampere meter with suitable CTs, thermal overload relay, inbuilt/separate single phase preventer, contactors, timers, spare NO-NC contacts, push buttons, ON, OFF, TRIP indication (LED Type) and potential free contacts and relay for interlocking to FDA etc. complete as required.								

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		vii.100 VA transformer 220v/24v AC for control wiring with 10 no.s 6A SP MCB 10 KA in all AHU panel is also in the scope of supply								
		viii.ACBS shall be BMS compatible with BACnet/ Modbus protocol								
		ix.All outgoing shall be provided with Stop / Manual /Auto selector switch to facilitate operation through BAS with RS 485 communication ports.								
		x.All out going shall be with extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps(LED) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for MCCB.								
		xi) Time delay relay for automatic restart of AHU motor.								
		xii) 24 volts wiring to the 2/3 way valve and thermostats.								
		xiii) wiring for micro switch smoke sensor and solenoid valve, and for stopping the fan when smoke / fire occurred through smoke sensor.								
		xiv) Control wiring with VFD. And in built fans for panel cooling.								
25.1		AC- DB -1, AC-DB-2 Equipment Panel in AC plant room								
		INCOMER								
		3 No. ACB Panels each having following:								
		3200A , 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip and lockable trip push button.								
		R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.								
		Push button to Close the ACB.								
		1 Digital multifunction meter with suitable CTs.								
		All ACBs should be computer compatible.								
		BUSBARS								
		3200 Amps TPN busbars of aluminium with temperture rise of 40 degree celsius over and above ambient temperture of 45 degree celsius.								

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		Bus Coupler								
		2 No. ACB Panels each having following:								
		3200A, 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip and lockable trip push button.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.								
		Push button to CLOSE the ACB.								
		1 Set of Digital Ammeter with ASS and CTs.								
		OUTGOING								
	i	3 Nos. ACB feeder as per following details/ specifications: For Water Chilling Machines								
		2000A , 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip and lockable trip push button.								
		R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.								
		Push button to Close the ACB.								
		1 Digital multifunction meter with suitable CTs.								
	ii	2 Nos. ACB feeder as per following details/ specifications: For CT-DB-3 , CT-DB-4 Panels								
		630A , 415 V, Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip and lockable trip push button.								
		R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB.								
		Push button to Close the ACB.								
		1 Digital multifunction meter with suitable CTs.								
	iii	3 Nos. MCCB feeder as per following details/ specifications:								
		300 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB microprocessor based, with O/L, S/C & E/F protection.								

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		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		3 Phase, fully automatic Star Delta starter for 90/100 hp condenser water pumps.								
	iv	3 Nos. MCCB feeder as per following details/ specifications:								
		250 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB microprocessor based, with O/L, S/C & E/F protection.								
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		3 Phase, fully automatic Star Delta starter suitable for 50/ 60 hp Primary chilled water pumps.								
	v	3 Nos. MCCB feeder as per following details/ specifications:								
		250 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB microprocessor based, with O/L, S/C & E/F protection.								
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		3 Phase, fully automatic Star Delta starter suitable for 75 hp Secondary chilled water pumps as bypass starter to VFD starter.								
	vi	3 Nos. MCCB feeder as per following details/ specifications:								
		200 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB microprocessor based, with O/L, S/C & E/F protection.								
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		3 Phase, fully automatic Star Delta starter suitable for 50 hp Secondary chilled water pumps as bypass starter to VFD starter.								
	vii	3 Nos. MCCB feeder as per following details/ specifications:								
		100 Amp 415 volts, 50 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								

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		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		3 Phase, fully automatic Star Delta starter suitable for 15 hp hot water pumps as bypass starter to VFD starter.								
	viii	6 Nos. MCCB feeder as per following details/ specifications:								
		32 Amp 415 volts, 50 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
	ix	4 Nos. MCCB feeder as per following details/ specifications :								
		160 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Complete panel as above	2	Panel						
25.2		CT- DB -3, CT-DB-04 Equipment Panel in AC plant room								
		INCOMER								
		1 No. ACB Panels each having following:								
		630 A , 415 V, 50 KA Motorised, Fully Drawout type (EDO), Four Pole, Air Circuit Breaker with microprocessor based overload, short circuit, Instantaneous & Earth Fault trip and lockable trip push button.								
		R, Y & B Phase indicating lamps (LED type) with 6A control SP MCBs.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		Indicating lamps (LED Type) with 6A protection MCBs to indicate OPEN, CLOSE, TRIP for ACB. Push button to Close the ACB. 1 Digital multifunction meter with suitable CTs. All ACBs should be computer compatible.								
		BUSBARS 800 Amps TPN busbars of aluminium with temperture rise of 40 degree celsius over and above ambient temperture of 45 degree celsius.								
		OUTGOING								
	i	12 Nos. MCCB feeder as per following details/ specifications: For Cooling Towers 100 Amp 415 volts, 50 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. 3 Phase, fully automatic Star Delta starter 20/15 HP for cooling tower fans/hot water pumps and spares as bypass starter to VFD starter.								
	ii	6 Nos. MCCB feeder as per following details/ specifications: 32 Amp 415 volts, 50 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection. Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers. Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP. Digital ammeter with selector switch with one set Suitable C.Ts.								
	iii	4 Nos. MCCB feeder as per following details/ specifications : 160 Amp 415 volts, 50 KA (Ics=Icu), TPN MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		Extended rotary operating mechanism with door interlock, defeat feature and padlock facility. MCCB should be with spreader link and phase barriers.								
		Indicating lamps (LED Type) with 6A protection MCBs to indicate ON, OFF, TRIP.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Complete panel as above	2	Panel						
25.3		Tertiary Pump Room Panels								
		Supply, installation, testing and commissioning of following M.V. cubicle type totally enclosed, wall mounted/Free standing type, powder coated, dust, damp and vermin proof, indoor type Distribution Board/Panel complete with busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, and having following incoming and outgoing switchgears complete as per technical specification and as required.								
		NOTE								
		i. All MCCBs shall have Ics=Icu=100%								
		ii. 100 VA transformer 220v/24v AC for control wiring with 10 no.s 6A SP MCB 10 KA in all panel is also in the scope of supply								
		iii. All starters shall be provided with digital ampere meter with suitable CTs, thermal overload relay, inbuilt/separate single phase preventer, contactors, Timers, spare NO-NC contacts, Push Buttons ON, OFF, TRIP indication (LED Type) and potential free Contact & relays for interlocking to FDA etc. complete as required.								
		iv. All indication Lamps will be LED Type.								
		v. All incomer and outgoing shall have extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.								
25.4		AC-DB-8 Pump Room Medical College								
		INCOMER :								
		125 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB TM based, with O/L, S/C & E/F protection.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar 300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	2 set - 63 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	6 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
25.5		AC-DB-9 Pump Room Medical Lab								
		INCOMER : 200 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB TM based, with O/L, S/C & E/F protection. R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication. 1 No. 0 to 500 V Digital voltmeter with selector switch. Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar 300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	3 set - 100 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	6 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
25.6		AC-DB-10 Pump Room Admin & Library Bock								
		INCOMER :								
		125 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB TM based, with O/L, S/C & E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	2 set - 63 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	6 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.0		Floor Distribution Panels								
		Supply, installation, testing and commissioning of following M.V. cubicle type totally enclosed, wall mounted/Free standing type, powder coated, dust, damp and vermin proof, indoor type Distribution Board/Panel complete with busbars, M.V. danger notice plate, interconnections with suitable capacity aluminium leads/solid aluminium strips/rods, connection of incoming and outgoing cables with thimbles, and having following incoming and outgoing switchgears complete as per technical specification and as required.								
		NOTE								
		i. All MCCBs shall have Ics=Icu=100%								
		ii. 100 VA transformer 220v/24v AC for control wiring with 10 no.s 6A SP MCB 10 KA in all AHU panel is also in the scope of supply								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		iii. All starters shall be provided with digital ampere meter with suitable CTs, thermal overload relay, inbuilt/separate single phase preventer, contactors, Timers, spare NO-NC contacts, Push Buttons ON, OFF, TRIP indication (LED Type) and potential free Contact & relays for interlocking to FDA etc. complete as required.								
		iv. All indication Lamps will be LED Type.								
		v. All incomer and outgoing shall have extended rotary operating mechanism with door interlocking with defeat feature and padlock facility. MCCB should have spreader links & phase barriers.								
26.1	AHP-1									
		INCOMER :								
		160 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB TM based, with O/L, S/C & E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	3 set - 63 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	7 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	5 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	19	Panel						
26.2	AHP-2									
		INCOMER :								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		1 nos. 160Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C, E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	1 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	12 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	8 set - 16 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iv	6 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.3		AHP-3								
		INCOMER :								
		1 nos. 200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C, E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		500 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
	i	4 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	8 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	8 set - 32 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	7	Panel						
26.4		AHP-4 (For OTs)								
		INCOMER :								
		250 Amp 415 volts, 35 KA (Ics=Icu), FP MCCB microprocessor based, with O/L, S/C & E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	2 set - 63 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	24 set - 32 A, 415 volts, 10 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	8 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.5		AHP-Terrace Floor (For TFAs and fans)								
		INCOMER :								
		1 nos. 250 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C,E/F protection.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	10 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C, E/F protection.								
	ii	10 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C, E/F protection.								
	iii	18 set - 16 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	2	Panel						
26.6		AHP- 4 (Medical College)								
		INCOMER :								
		1 nos. 200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C,E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	6 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	4 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
	iii	4 set - 32 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.7		AHP- 5 (Library & Admin)								
		INCOMER :								
		1 nos. 125 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C,E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		1 No. 0 to 500 V Digital voltmeter with selector switch.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar								
		300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	2 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	6 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	4 set - 32 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.8		AHP- 6 (Medical Lab)								
		INCOMER :								
		1 nos. 200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C,E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		Bus Bar 300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	2 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	30 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	6 set - 32 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
26.9		AHP- 7 (Medical Lab)								
		INCOMER :								
		1 nos. 200 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C,E/F protection.								
		R,Y&B phase indicating lamp (LED type) with 6A control SP MCB & ON, OFF, TRIP Indication.								
		Digital ammeter with selector switch with one set Suitable C.Ts.								
		Bus Bar 300 A TPN Aluminium bus bar 415V , 50 Hz.								
		OUTGOINGS :								
	i	5 Set- 63 Amp 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	ii	18 set - 32 A, 415 volts, 35 KA FP MCCB with thermal magnetic release having variable current settings of O/L, S/C protection.								
	iii	6 set - 32 A, 415 volts, 10 KA C- Curve, Four Pole, Miniature Circuit Breaker.								
		Complete panel as above	1	Panel						
27		FAN STARTER PANEL - DOL / STAR DELTA STARTER								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
		Supply, installation, testing & commissioning of Fan Starter Panel with following details :								
		Each Fan Starter Panel shall have :								
	a.	14G CRCA Powder Coated panel enclosure with earthing studs & hinged locable doors. IP55 Protection, suitable for 415V, 3 Phase, 4 wire, 50Hz system.								
	b.	Type-II co-ordination switchgear.								
	c.	Incomer switch shall be TP MPCB of required rating & fault withstand capacity. MPCB shall be with overload & short circuit protection.								
	d.	R,Y,B LED Type Phase indication lamps with control MCB's.								
	e.	Auto / Manual Selector switch & ON & OFF Push buttons for manual operation & terminals for BMS wiring.								
	f.	ON' Indication LED Type lamp with control MCB.								
	g.	DOL Starter / Contactor for motors upto 10HP, with 2 NO + 2 NC Auxiliary contacts.								
	h.	Star-Delta starter / contactors / timers for motors beyond 10HP, with 2 NO + 2 NC Auxiliary contacts.								
	i.	All internal control & power wiring.								
	j.	Voltage operated 'SPP' (Single Phasing Preventor) .								
	k.	Cast resin CT's (3 Nos. for more than 5HP motors) & single CT for motors upto 5HP for metering purposes. CT's shall be of required class & burden.								
	l.	Digital VA Meter .								
	m.	Control terminals / linkage / interlocking with fire detection system & fire dampers, so that Fresh air Fan motor trips on receiving a fire signal & normal & smoke exhaust fans start on receiving a fire signal. Manual control shall also be possible through an override.								
		Lift well pressurization fans /ventilation fans								
27.1		Fan Starter Panel for 12.5 HP Motor	1	Nos.						
27.2		Fan Starter Panel for 10 HP Motor	1	Nos.						
27.3		Fan Starter Panel for 7.5 HP Motor	10	Nos.						
27.4		Fan Starter Panel for 5 HP Motor	40	Nos.						
27.5		Fan Starter Panel for 3 HP Motor	30	Nos.						
27.6		Fan Starter Panel for .5-2 HP Motor	130	Nos.						

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
28.0		CABLING								
28.1		Supplying, laying, effecting proper connections, testing & commissioning of following size of 1.1 kv XLPE insulated aluminium conducting armoured cables as per IS 7096 laid underground/cable tray/on surface of wall/hume pipe etc. & termination with brass double compression glands as required.								
28.1.1		3.5Cx 300 sq.mm cable	500	Mtr						
28.1.2		3.5Cx 240 sq.mm cable	300	Mtr						
28.1.3		3.5C x 185 sq.mm cable	200	Mtr						
28.1.4		3.5C x 150 sq.mm cable	250	Mtr						
28.1.5		3.5C x 120 sq.mm cable	500	Mtr						
28.1.6		3.5C x 95 sq.mm cable	500	Mtr						
28.1.7		3.5C x 70 sq.mm cable	300	Mtr						
28.1.8		3.5C x 50 sq.mm cable	450	Mtr						
28.1.9		3.5C x 35 sq.mm cable	300	Mtr						
28.1.10		4C x 25 sq.mm Cable	300	Mtr						
28.1.11		4 C X 16 sq. mm. Cable	800	Mtr						
28.1.12		3 C X10 sq. mm. Cable	1800	Mtr						
28.1.13		4 C X 6 sq. mm. Cable	380	Mtr						
28.1.14		4 C X 4 sq. mm. Cable	500	Mtr						
28.1.15		3C X 6 sq. mm. Cable	1800	Mtr						
28.1.16		3C X 4 sq. mm. Cable	4000	Mtr						
28.2		Supplying, laying, effecting proper connections, testing & commissioning of following size of 1.1 kv FR PVC insulated multistranded flexible copper conductor as per IS 694 laid underground/cable tray/on surface of wall/hume pipe etc. & termination with double compression glands as required.								

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
28.2.1		185 sq.mm cable	1200	Mtr						
28.2.2		150 sq.mm cable	400	Mtr						
28.2.3		95 sq.mm cable	500	Mtr						
29.0		CABLE TRAYS								
29.1		Supply & installation of following sizes of perforated MS cable trays including horizontal & vertical bends, reducers, tees, cross members and other accessories as required and duly supported from the ceiling/wall/floor with MS suspenders/supports and including painting etc. as required								
29.1.1		450 mm widthx50 mm deep x2.0 mmthickness	250	Mtr						
29.1.2		300 mm widthx50 mm deep x1.6 mmthickness	500	Mtr						
29.1.3		200 mm widthx50 mm deep x1.6 mmthickness	500	Mtr						
29.1.4		150 mm widthx50 mm deep x1.6 mmthickness	750	Mtr						
30.0		EARTHING								
30.1		Earth pits with GI earth plate of size 600mmx600mmx6mm thick including all accessories , down watering GI pipes 40mm dia and providing masonry enclosure with cover plate having interlocking arrangement and watering pipe etc. with charcoal of or coke and salt) complete as required	20	Set						
30.2		Providing & fixing GI earth strip 40mm x 6mm on surface or in recess for earth connections etc. as required	750	Mtr						
30.3		Providing and fixing GI earth strip on walls/ trenches complete as per specifications and as required.								
30.3.1		50mmx 5mm	500	Mtr						
30.3.2		25mm x 3mm	1000	Mtr						

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
30.4		Providing and fixing earth wire of complete as per specifications as required.								
30.4.1		6 SWG wire	1200	Mtr						
30.4.2		8 SWG wire	600	Mtr						
31.0		CONTROL CABLING								
		Supply, laying, effecting proper connections, testing & commissioning of 1.5 sq.mm. PVC insulated copper multicore cables from AHU's and AC equipments to central control console								
31.1		8 core cable	10000	Mtr						
31.2		6 core cable	5000	Mtr						
31.3		2 core cable	3000	Mtr						
E)	NDSR	IBMS								
32.0		BUILDING MANAGEMENT SYSTEM								
	A)	Supply, installation, testing, commissioning & handing over of the following :								
32.1	1.0	BMS Computer System: server grade latest Intel® i7 7th Generation, processor, Intel Chipset motherboard, 8GB DDR3 RAM, 1TB SATA HDD at 7200 rpm, Graphic card with 2 GB dedicated RAM with display ports/DVI/ HDMI port, DVD writer, Giga LAN Card, Keyboard, optical Mouse, 42" colour graphics TFT monitor & Original Windows10 loaded.	1	Set						

Item No. 1	DSR/ NDSR 2	Description 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
32.2	2.0	BMS System Software : Web Based Graphical Software meeting the requirements in the Given I/O Summary & technical specifications including configuration and facility to create / provide the graphic mapping for all I/O Summary points, animate the Graphics, Navigation between pages, display of logs, changing the time zones, popup alarms, configurable password protection for Building Mgmt System as per Specifications. Software shall be able to communicate with Bacnet, Modbus devices simultaneously, with unlimited user license capacity. This includes the programming / commissioning software also. This software shall be capable of sending EMAIL/SMS alerts to predefined numbers. Energy Management suit for integrating the energy meters as mentioed in IO summary. The EMS shall be capable of generating various trends, graphs and producing at least 10 reports.	1	Lot						
32.3	3.0	Soft Integrators: for integration of various third subsystems. These integrators shall support the open protocols like Modbus, BACNet, and others. They should have all required RS485, RS232, Ethernet ports inbuilt. Each subsystem shall have its dedicated set of soft integrators and multiple subsystems of same kind only shall be looped in single soft integrator. Integrator quantity shall be decided based on the number of equipments and number of points for each equipment as mentioed in IO summary.								
	a	Chiller integration- 4 Nos- 20 points each	1	Set						
	b	AHU VFD integration- 95 Nos- 6 points each	1	Set						
	c	Lifts - 18 Nos.- 15 points each	1	Set						
	d	UPS- 2 Nos- 40 points per UPS	1	Set						
	e	Energy meters- 91 Numbers- 10 points per meter	1	Set						
	f	Fire Alarm System - 4000 Detectors, 5 panels	1	Set						

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32.4	4.0	UL listed, BTL certified web based, IP enabled DDC Controllers with inbuilt webserver, with I/O module, to meet the IO summary listed, The controllers shall be minimum 32 bit microprocessor based standalone working on TCP/IP on Bacnet IP with integral web browser, calendar function complete with day, month, week, year etc, real time clock & 1 second scan time. The DDC's shall be capable of peer to peer communication without help of communication controller / router / system interface controller / PC. These DDCs shall have required LAN ports to communicate with other DDCs and the software on BACNet-IP only. The DDCs shall be supplied with locable mounting cabinets duly powder coated connector strip, internal wiring and space to house controller & relays, connector strip step down transformer, MCB, internal wiring and other accessories as required. (Contractor shall confirm his I/O provision w.r.t requirement on basis of data point). If DDCs work on 24V supply then the power supply unit (SMPS) must be UL listed. Each DDC shall have 15% spares from the IO summary. Housing for Controllers should be of Rittal, Indiatech, Sunda								
	a	DDC for Chiller plant as per IO summary with 15% spares	1	Set						
	b	DDC for AHU as per IO summary with spares as mentioed in IO summary (Max 2 AHUs in one DDC)	47	Set						
	c	DDC for CSU as per IO summary with spares as mentioed in IO summary (Max 2 AHUs in one DDC)	22	Set						
	d	DDCs for Smoke Extraction Fans as mentioed in IO summary with 15% spares	1	Lot						
	e	DDCs for Fresh Air Fans as mentioed in IO summary with 15% spares	1	Lot						
	f	DDCs for Pressuriazation Fans as mentioed in IO summary with 15% spares	1	Lot						
	g	DDCs for Fire Fighting as mentioed in IO summary with 15% spares	1	Lot						
	h	DDCs for Water Supply as mentioed in IO summary with 15% spares	1	Lot						
	i	DDCs for HT & LT panel as mentioed in IO summary with 15% spares	1	Lot						
33.0	B)	Field Devices								
		Supply, installation, testing, commissioning of necessary Input sensor transmitters/transducers comprising the following:								

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33.1	1.0	Immersion Temp Sensor for CHW line with brass thermowell. Measuring range: -30 to 110 Deg C, Accuracy: +/- 1.3 Deg C	17	Nos.						
33.2	2.0	Outside Temp & Humidity Sensor with radiation shield. Measuring Range: Temp:-30 to 50 Deg C & RH 0-100%, Accuracy: +/- 1 Degc +/- 3%	1	Nos.						
33.3	3.0	Water Differential pressure switch. Trigger Range:150-1000mbar with 1A (resistive) @ 240V AC contact rating	58	Nos.						
33.4	4.0	Water Pressure Sensor . Accuracy:+/-0.3% FSL	2	Nos.						
33.5	5.0	Duct mounted Temp & Humidity Sensor with radiation shield. Measuring Range: Temp:-30 to 50 Deg C & RH 0-100%, Accuracy: +/- 1 Degc +/- 3%	136	Nos.						
33.6	6.0	Air static pressure Sensor in AHU ducts	20	Nos.						
33.7	7.0	CO2 sensor Duct mount type Measuring range: 0 to 2000 ppm	136	Nos.						
33.8	8.0	Wall mounted Ambient CO2 sensor	1	Nos.						
33.9	9.0	Differential pressure switch for filters & Blowers	430	Nos.						
33.10	10.0	Level Switches (Hi/Low)	26	Nos.						
33.11	11.0	Flame proof level transmitter	6	Nos.						
34.0	C)	Conduiting , Wiring and cabling								
34.1	1.0	Supply, installation, testing and commissioning of following cables:								
34.2	2.0	2 Core 1.0 Sqmm, unarmoured ATC conductor multistranded, unshielded cable for Signals	50000	RM						
34.3	3.0	2 Core 1.5 Sqmm, unarmoured ATC conductor multistranded, shielded cable for Integration	5000	RM						
34.4	4.0	3 Core 1.5 Sqmm, unarmoured ATC conductor multistranded, cable for Powering DDC , Actuators.	4000	RM						
34.5	5.0	Cat-6 networking cable	12000	RM						
34.6	6.0	Optical Fibre Cable with Flexible Duct & all accessories to make network to communicate between L2 / L3 Switches of different buidings	1000	RM						
34.7	7.0	L2/L3 network switches along with Suitsable Rack of suitable specifications to create the desired LAN for IP based DDCs. The specifications and number of the switches shall be calculated based on the design and DDC configuration. All the required accessories, racks etc, shall be included in this line item	1	Lot						

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34.8	8.0	Supplying and laying of following sizes of MS conduit on surface/recess including cutting/filling chases along with conduit accessories etc. complete as required.								
	i.	Supplying & erecting ISI mark Rigid Steel conduit 16 SWG 20 mm dia. with necessary accessories in wall/floor with chiselling appropriately	11500	RM						
	ii.	Supplying & erecting ISI mark Rigid Steel conduit 16 SWG 25 mm dia. with necessary accessories in wall/floor with chiselling appropriately	8000	RM						
	iii.	Supplying & laying ISI mark Rigid Steel conduit 16 SWG - 20 mm. dia.with necessary accessories in RCC work/false ceiling/false flooring	11500	RM						
	iv.	Supplying & laying ISI mark Rigid Steel conduit 16 SWG -25 mm. dia.with necessary accessories in RCC work/false ceiling/false flooring	8000	RM						
		TOTAL FOR HVAC WORKS (Market Items)								

COST ESTIMATE OF IT WORKS (NDSR Items) FOR "HOSPITAL & MEDICAL COLLEGE" at CHANDRAPUR (MAHARASHTRA)

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/I/C Excluding GST (Rs.) 10	Rate of GST For I/I/ C (%) 11
The prices are to be quoted in the below mentioned form and shall include the supply, installation, testing & commissioning at site of all the equipments, ancillary materials as specified and all such items what so ever which may be required to fulfill the intent and purpose as laid down in the specifications.										
	Hospital Management and Information System(HMIS)		0							
1.00	Supply, Customization, Installation, Testing, Implementation, Integration, Training and Maintenance of Hospital Management and Information System as per the Scope of work, Deliverables of the project, Functional and Technical requirements, Terms and Conditions mentioned in the tender document and as per the requirement and complete in all respect and satisfaction of the engineer.		Lumpsum	-						
	Subtotal HMIS									
	Server Hardware and System Software including common storage & NAS for HMIS & PACS									
2.0	Supply, Installation, Configuring, Testing & Commissioning of (1). SAN Storage (Minimum 64 TB capacity or higher) for HMIS & PACS (2) All the servers (cluster mode) for HMIS and PACS (3) Rack mounted NAS (32TB capacity) for backup of HMIS & PACS separately and TAPE Drive & Backup software All the above mentioned should be with latest technology, associated hardware, OS, Database, software, network devices, Network load balancer-2 nos., switches, cables with all the accessories etc. as per the requirement & complete in all respect and satisfaction of the engineer and have 3 years OEM warranty. All the servers except database server will be Active-Active cluster mode with latest configuration and technology as per the functional and technical requirements and completeness of the system (with minimum 3 years onsite comprehensive operation & maintenance support) . Database server will be cofigured as Active-Passive Mode. (Make- As per approved make)	Server Hadware- HP/Dell, Common Storage for HMIS & PACS- Cisco/HP/Del/IBM/EMC2	As per the requirement	-						
	Subtotal (Server Hardware and System Software including common storage & NAS for HMIS & PACS)									
	Radiology Information System and Picture Archival and Communication System (RIS-PACS)									
3.0	Supply, Customization, Installation, Testing, Implementation, Integration with HMIS (HL7 interface), Training and Maintenance of RIS-PACS solution including 3D advance post processing workstation software as per the Scope of work, Deliverables of the project, Functional and Technical requirements, Hardware and System requirements, Terms and Conditions mentioned in the tender document and as per the requirement and complete in all respect and satisfaction of the engineer (with 3 years onsite comprehensive operation & maintenance support)	PACS Workstation - HP/Dell PACS Workstation Monitor (Display) - Barco or equivalent	As per the requirement	-						
	PACS Workstation									

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4.0	Supply, Installation, Configuring, Testing, Commissioning of Radiology workstation for PACS including CT/MRI/X RAYS (Quad core Intel 64 bit Processor or higher, 16 GB RAM or higher, Windows OS, 6MP Medical Grade Color Diagnostic display for softcopy reporting and 2MP clinical review medical grade display for RIS with graphic card to support three displays, including necessary hardware and software, all the accessories etc. and 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	PACS Workstation - HP/Dell PACS Workstation Monitor (Display)- Barco or equivalent	1	No						
5.0	Supply, Installation, Configuring, Testing, Commissioning of PET-CT Workstations for PACS (Quad core Intel 64 bit Processor or higher, 16 GB RAM or higher, Windows OS, 4MP Medical Grade Color Diagnostic display for softcopy reporting and 2MP clinical review medical grade display for RIS with graphic card to support three displays, including necessary hardware and software, all the accessories etc. and 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	PACS Workstation - HP/Dell PACS Workstation Monitor (Display)- Barco or equivalent	1	No						
6.0	Supply, Installation, Configuring, Testing, Commissioning of Ultrasound Workstations for PACS (Quad core Intel 64 bit Processor or higher, 16 GB RAM or higher, Windows OS, Dual 2 MP Clinical Grade Color monitor with graphic card (BARCO or equivalent make), including necessary hardware and software, all the accessories etc. and 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	PACS Workstation - HP/Dell PACS Workstation Monitor (Display)- Barco or equivalent	1	No						
Server, Software & Accessories for Speech Recognition										
7.0	Supply, Installation, Configuring, Testing, Commissioning of latest Speech Recognition Application (5 licenses) and associated hardware, software, Network device, all the accessories and equipment etc. Technical specification should be latest and match the requirements of selected PACS and HMIS vendor. It should have 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer	Nuance Dragon Speech Recognition or equivalent	1	No						
Film Digitizer with Software										
8.0	Supply, Installation, Testing, Implementation, Integration with PACS, Training and Maintenance of Film Digitizer along with workstation, accessories, software and 3 years onsite comprehensive operation & maintenance support		1	No						
Robotic CD/DVD Writers										
9.0	Supply, Installation, Testing, Implementation, Integration with PACS, Training and Maintenance of dual-drive disc publisher in a black painted steel cabinet for desktop or rack mount use. Includes two built-in DVD±R/CD-R recorders and integrated high-speed 4800 dpi inkjet printing, individual CMYK ink cartridges, design software, power cord, high-speed USB 2.0 cable and instructions. 100-disc kiosk kit is included and 3 years onsite comprehensive operation & maintenance support		1	No						
Subtotal (PACS)										
Computer Desktops, Printers, Tablets, UPS & other Software etc.										

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10.0	Supply, Installation, Configuring, Testing, Commissioning of latest Antivirus Server (in cluser mode) for all the desktops (approx. 200 nos.) and all Servers (HMIS & PACS) with associated hardware, OS, software, all the accessories and equipment etc. Technical specification should be latest and match the requirements. It should have 3 years OEM warranty for server hardware (Make- As per approved make) and 3 years subscriptions for the Antivirus Software (Make- As per approved make) as per the requirement & complete in all respect and satisfaction of the engineer.	HP/Dell	1	No						
11.00	Supply, Installation, Testing, Commissioning of latest Desktop Computer (i5 Based) with all the accessories and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP/Dell	125	No.						
12.00	Supply, Installation, Testing, Commissioning of latest Desktop Computer (i7 Based) with all the accessories and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP/Dell	25	No.						
13.00	Supply and Installation of latest Microsoft Office 2013 Professional License for desktops as per the requirement & complete in all respect and satisfaction of the engineer		30	No.						
14.00	Supply, Installation, Testing, Commissioning of latest Stylish Tablet with all the accessories and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make -As per approved make)	Samsung/HP/Dell	15	No.						
15.00	Supply, Installation, Testing, Commissioning of Latest Stylish Light weight Notebook PC (i7 based) as per technical specifications mentioned with all the accessories and 3 years maintenance support through 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer	HP/Dell	5	No						
16.00	Supply, Installation, Testing, Commissioning of latest Bar code printer for Lab, Pharmacy and other places with all the accessories etc. and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer		10	No						
17.00	Supply, Installation, Testing, Commissioning of latest Bar code reader for Lab, Pharmacy and other places with all the accessories etc. and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer		10	No						
18.00	Supply of chip based/magnetic Smart Card with at least 4K memory capable to capture patient demographic data including web cam picture & able to be read by the reader complete as per specifications as required and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer .		500	No.						
19.00	Supply, Installation, testing of smart card reader/writer complete as per specifications as required complete in all respect and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer		2	No.						

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20.00	Supply, installation, testing & commissioning of Biometric Readers complete as per specifications as required and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer.		2	No.						
21.00	Supply, testing of SDK for integrating Smart Cards with existing system and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer.		1	No.						
22.00	Supply, installation, testing & commissioning of Wrist Bands (same reader/writer for smart card should be used) complete as per specifications as required and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer.		50	No.						
23.00	Supply, installation, testing & commissioning of RFID Stationed unit antenna (for Wrist Bands) complete as per specifications as required and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer.		1	No.						
24.00	Supply, Installation, testing & commissioning of SDK for integrating Wrist bands with existing system and 3 years OEM onsite warranty & as per the requirement & complete in all respect and satisfaction of the engineer		1	No.						
25.00	Supply, Installation, testing & commissioning of Digital Notepad with software utility with existing system for conversion of hand written prescription to text in EHR/Doctor's Desk module of HMIS and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer		2	No.						
26.00	Supply, Installation, testing & commissioning of SDK for integrating Digital Notepad with existing system and 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer		1	No.						
	Printers									
27.00	Supply, Installation, Testing, Commissioning of latest Black and White LaserJet Printer with all the accessories etc. and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP	75.00	No.						
28.00	Supply, Installation, Testing, Commissioning of Original OEM Cartridge for the above printer with all accessories etc. and as per the requirement & complete in all respect and satisfaction of the engineer	HP	10.00	No.						
29.00	Supply, Installation, Testing, Commissioning of latest LaserJet Multifunction (Print, Scan, Copy, Wireless) Printer with all the accessories etc. and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP	30.00	No.						
30.00	Supply, Installation, Testing, Commissioning of Original OEM Cartridge for the above printer with all accessories etc. and as per the requirement & complete in all respect and satisfaction of the engineer	HP	2.00	No.						
31.00	Supply, Installation, Testing, Commissioning of latest Color LaserJet Printer with all the accessories etc. and as per technical specifications 3 years OEM warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP	2.00	No.						

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32.00	Supply, Installation, Testing, Commissioning of Original OEM Cartridge for the above printer (Complete set of colours) with all accessories etc. and as per the requirement & complete in all respect and satisfaction of the engineer	HP	2.00	No.						
33.00	Supply, Installation, Testing, Commissioning of latest Flatbed Document Management Scanners with all the accessories etc. and as per technical specifications 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer (Make - As per approved make)	HP	2.00	No.						
34.00	Desktop VC Based Tele Medicine Cart - All in One , Processor i5, RAM4 GB, Hard Disk Drive 1 TB, Screen Size 21 inch, OS Windows, Ethernet Card, Wi-Fi, Anti Virus Subscription 1 Year, Warranty 3 Years mounted on Cart with in built Battery Height Adjustment Medical Casters Battery power button, PC power button Tele-consultation application with inbuilt Software based Video Conferencing license. E-Visiting application		1.00	No.						
35.00	UPS(Make - As per approved make)									
35.01	Supply, installation , testing and commissioning of 80 KVA UPS as mentioned above with all the accessories etc. and as per technical specifications 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer. For other guidelines refer to the electrical specifications. UPS(Make - As per approved make)	UPS System- APC/Eaton Power ware/Emerson/Schneider UPS Battery - Panasonic/Hitachi/Cummins/Exide	1.00							
35.02	Supply, installation , testing and commissioning of 60 KVA UPS as mentioned above with all the accessories etc. and as per technical specifications 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer. For other guidelines refer to the electrical specifications. UPS(Make - As per approved make)	UPS System- APC/Eaton Power ware/Emerson/Schneider UPS Battery - Panasonic/Hitachi/Cummins/Exide	2.00							
35.03	Supply, installation , testing and commissioning of 20 KVA UPS as mentioned above with all the accessories etc. and as per technical specifications 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer. For other guidelines refer to the electrical specifications. UPS(Make - As per approved make)	UPS System- APC/Eaton Power ware/Emerson/Schneider UPS Battery - Panasonic/Hitachi/Cummins/Exide	1.00							
35.04	Supply, installation , testing and commissioning of 40 KVA UPS as mentioned above with all the accessories etc. and as per technical specifications 3 years OEM onsite warranty as per the requirement & complete in all respect and satisfaction of the engineer. For other guidelines refer to the electrical specifications. UPS(Make - As per approved make)	UPS System- APC/Eaton Power ware/Emerson/Schneider UPS Battery - Panasonic/Hitachi/Cummins/Exide	1.00	No.						

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	SUBTOTAL									
	Computer Network Infrastructure (LAN & Wi- Fi)									
36	Core Switch and Distribution Switch (Make - As per approved make)									
36.1	Supply, installation, testing and commissioning of Core Switch as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer along with 24X7 support and 3 year comprehensive warranty	HP/Cisco/Juniper/Brocade	2	No.						
36.2	Supply, installation, testing and commissioning of Distribution Switch as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer along with 24X7 support and 3 year comprehensive warranty	HP/Cisco/Juniper/Brocade	3							
37	Access Switch (Make - As per approved make)									
37.1	Supply, installation, testing and commissioning of 48-port Access Switch with 3 years comprehensive warranty and support as per the technical specification mentioned as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	HP/Cisco/Juniper/Brocade	28	No.						
37.2	Supply, installation, testing and commissioning of 24-port Access Switch with 3 years comprehensive warranty and support as per the technical specification mentioned as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	HP/Cisco/Juniper/Brocade	10	No.						
37.3	Supply, installation, testing and commissioning of 24-port POE+ switch with 3 years comprehensive warranty and support as per the technical specification mentioned as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	HP/Cisco/Juniper/Brocade	40	No.						
37.4	Supply, installation, testing and commissioning of 10G BASE-LR, SFP+ optic, LC Connector optical monitoring capable for core switch as per the requirement & complete in all respect and as directed to the satisfaction of engineer	HP/Cisco/Juniper/Brocade	17	No.						
37.5	Supply, installation, testing and commissioning of 10G BASE-SR, SFP+ optic, LC Connector optical monitoring capable for core switch as per the requirement & complete in all respect and as directed to the satisfaction of engineer	HP/Cisco/Juniper/Brocade	160	No.						
38.0	Wireless Solution (Make - As per approved make)									
38.1	Supply, installation, testing and commissioning of Wireless Access Point (Indoor) with Power over Ethernet Adapter (100/1000 Mbps), Wall mounting device, Universal horizontal ceiling etc. and 3 years comprehensive warranty as per the technical specification and as per requirement & complete in all respect and as directed to the satisfaction of engineer	Cisco/Ruckus/Aruba	211	No.						
38.2	Supply, installation, testing and commissioning of Wireless Access Controller for above mentioned Wireless Access Points with 3 years comprehensive warranty, support and updates as per the technical specification and as per requirement & complete in all respect and as directed to the satisfaction of engineer	Cisco/Ruckus/Aruba	1	No.						
39.0	Network Management Solution (NMS) (Make - As per approved make)									

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39.1	Supply, installation, testing and commissioning of NMS solution with minimum of 3 years support is required and 24X7 support for the software as per requirement and as per technical specification mentioned & complete in all respect and as directed to the satisfaction of engineer.	HP/Cisco/Juniper/Brocade	1	No.						
40.0	Firewall Appliance (Make - As per approved make)									
40.1	Supply, installation, testing and commissioning of Appliance based Firewall with internal/external IPS/IDS with 3 years subscription includes Anti Malware, Anti Spam, Web and Application Filter, Intrusion Prevention System and 24 x 7 Support for around 750 users or more as per technical specification mentioned as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Fortinet/Sophos/Cisco/Checkpoint/ Palo Alto	1	No.						
41.0	Server Hardware (Make - As per approved make)									
41.1	Supply, installation, testing and commissioning of Server Hardware as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	HP/Dell	2	No.						
41.2	Supply, installation, testing, commissioning and integration of Latest Operating System for NMS as per technical specification mentioned with 3 years comprehensive support warranty as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		2	No.						
Passive Components										
42.0	CAT6 A Components (Make - As per approved make)									
42.1	Supply, Laying, testing and commissioning of Cat 6A Cable as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	117,000	Mtr						
42.2	Supply, installation, testing and commissioning of Face Plate 1 Port - White as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	877	No.						
42.3	Supply, installation, testing and commissioning of Face Plate 2 Port - White as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	700	No.						
42.4	Supply, installation, testing and commissioning of Cat6A RJ45 Sheilded Jack as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	1,800	No.						
42.5	Supply, installation, testing and commissioning of Cat 6A Patch/Mounting Cord 1 mtrs as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	1,800	No.						
42.6	Supply, installation, testing and commissioning of Cat 6A Patch/Mounting Cord 2 mtrs as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	1,800	No.						

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
42.7	Supply, installation, testing and commissioning of GANG Box, 1 Port/2 Port, White as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	1,800	No.						
42.8	Supply, installation, testing and commissioning of Cat6A shielded RJ45 connectors as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer	Molex / Systimax / Panduit / AMP/ R&M	50	No.						
42.9	Supply, installation, testing and commissioning of 24 Port loaded Patch Panel including adapters etc. as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	90	No.						
43.0	Optical Fiber Cable Components (Make - As per approved make)									
43.1	Supply, installation, testing and commissioning of 24 port MM LC LIU Fibre Panel- Unloaded as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	22	No.						
43.2	Supply, installation, testing and commissioning of 12 port MM LC LIU Fibre Panel- Unloaded as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	38	No.						
43.3	Supply, installation, testing and commissioning of 12 port SM LC LIU Fibre Panel- Unloaded as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	6							
43.4	Supply of LC Pigtail, MM, 50/125, 900 micron as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	1,008	No.						
43.5	Supply of 6 Core OS2 FOC cable as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	7,000							
43.6	Supply of LC Pigtail, SM, 9/125, 900 micron as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	102							
43.7	Supply, installation, testing and commissioning of LC-LC, 50/125 OM4 Multimode, 3 Mtrs Patchcord as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	168							
43.8	Supply, installation, testing and commissioning of LC-LC, 9/125 OS2 Singlemode, 3 Mtrs Patchcord as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	17	No.						
43.9	Supply, Laying, testing and commissioning of 6 Core OM4 FOC cable as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Molex / Systimax / Panduit / AMP/ R&M	7,180	No.						
44.0	Equipment Racks, UPS and other accessories									
44.1	Supply, installation, testing and Commissioning of 19" Rack 12 U Wall Mount Rack with all standard accessories that include Cable Manager, Power Bar with sockets etc. as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Valrack/Rittal/Netrack	7	No.						

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
44.2	Supply, installation, testing and Commissioning of 19" Rack 15 U Wall Mount Rack with all standard accessories that include Cable Manager, Power Bar with sockets etc. as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Valrack/Rittal/Netrack	31	No.						
44.3	Supply, installation, testing and Commissioning of 19" Rack 27 U Wall Mount Rack with all standard accessories that include Cable Manager, Power Bar with sockets etc. as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Valrack/Rittal/Netrack	3	No.						
44.4	Supply, excavation up to 3 feet of 40mm HDPE Pipe (Standard ISI mark) as per the requirement & complete in all respect and as directed to the satisfaction of engineer.(Including civil related works for the laying of conduit & cabling etc. as per the industrial standards and as per the scope of work mentioned in the tender document).	Valrack/Rittal/Netrack	2,000	Mtr						
44.5	Supply, installation, testing and Commissioning of Smart Rack Type-2 with all standard accessories that include Cable Manager, Power Bar with sockets, cooling provision etc. as per the technical specification mentioned and as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Valrack/Rittal/Netrack	1	No.						
SUBTOTAL										
Queue Management System (QMS)										
45.0	Supply, installation of Main QMS Back end Server Software - Administrator Module - QMS Web Reporting Module - QMS Web Dashboards - QMS Web Analysis - QMS DB Server Module - SMS Module - System integration module - Web Appointment Module - Feedback system module - Digital signage module as per specifications complete as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		1.00	Set						
46.0	Supply, installation of Browser based calling terminal 01 x user license for registration counter as per technical specification as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		10.00	Set						
47.0	Supply, installation of Browser based calling terminal 01 x user license for Dr. Room as per technical specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		60.00	Set						
48.0	Supply, installation of Thermal token Printer with touch screen 15" with Pedestal /Wall mount stand Bar Code print as per specifications complete as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		4.00	Set						
49.0	Supply, installation of Full Size Self Appointment Kiosk - 01 x user license 17" Touch screen LCD panel - Bar Code Reader - Pedestal Stand - thermal Ticket Printer - patient feedback option Inbuilt processor complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		1.00	Set						
50.0	Supply, installation of Server PC (QMS Application, Database, Appointment & Backup server) Processor: Quad Core Xeon Processor Hard Drive: 2 x 1TB SATA II, RAID1 complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		2.00	Set						
51.0	Supply, installation of 50" LED TV - VGA/HDMI Port - Wall/ Mounting/ ceiling mounting Bracket complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Sony/Panasonic/Samsung	6.00	Nos.						

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
52.0	Supply, installation of 40" LED TV - VGA/HDMI Port - Wall Mounting/ ceiling mounting Bracket complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.	Sony/Panasonic/Samsung	6.00	Set						
53.0	Supply, installation of Queue number LED Display with ceiling mounting - Counter status - Display Messages complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		60.00	Set						
54.0	Supply, installation of VGA Spilliter(Port) with adapter - Voice Module (Hindi, English & Marathi language) with Mic complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		1.00	Set						
55.0	Supply, installation of Hardware keypad terminal complete as per specifications as per the requirement & complete in all respect and as directed to the satisfaction of engineer.		60.00	Nos.						
56.0	Supply of Thermal Ticket rolls width 60mm, 2000 tickets without refill and 120 meter roll length as per specification as per the requirement & complete in all respect and as directed to the satisfaction of engineer		200.00	Roll						
	SUBTOTAL - QMS									

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
57.1	Supply, Customization, Installation, Testing, Implementation, Integration, Training and Maintenance of Library Management Software as per the Functional and Technical requirements, Terms and Conditions mentioned in the tender document, minimum 3 years maintenance support and as per the requirement and complete in all respect and satisfaction of the engineer		1	No						
57.2	Supply, installation, testing and commissioning of Staff Station Reader complete in all respect and as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1	No						
57.3	Supply, installation, testing and commissioning of Gate Antenna Security System complete in all respect as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1 Set	No						
57.4	Supply, installation, testing and commissioning of RFID Handheld Reader complete in all respect as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1	No						
57.5	Supply, installation, testing and commissioning of RFID Tags for Books including taging job, complete in all respect as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		5000	No						
57.6	Supply, installation, testing and commissioning of RFID 1KB Member Card complete in all respect and as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		500	No						
57.7	Supply, installation, testing and commissioning of RFID Middleware Software (centralized Control System / Software for all RFID hardware) complete in all respect as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1	No						
57.8	Supply, installation, testing and commissioning of Self Check out Kiosk complete in all respect and as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1	No						
57.9	Supply, installation, testing and commissioning of Anti Theft Sticker complete in all respect and as per the requirement and as directed to the satisfaction of the engineer		8000	No						
57.10	Supply, installation, testing and commissioning of Book Drop Station complete in all respect and as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		1	No						
57.11	Supply, installation, testing and commissioning of Member Card Printer with 5 Ribbon And 2 Cleaning Kit complete in all respect and as per the technical specification mentioned and as per the requirement and as directed to the satisfaction of the engineer		2	No						

Item No. 1	Description 2	Make 3	Qty. 4	Unit 5	Rate For Supply only (Excluding GST) in Rs. 6	Total Supply Amount (Excluding GST) in Rs. 7	Rate of GST for Supply (%) 8	Rate For Installation, Testing, Commissioning (Excluding GST in Rs.) 9	Total Amount For I/T/C Excluding GST (Rs.) 10	Rate of GST For I/T/ C (%) 11
57.12	Supply, installation, testing and commissioning of Central Server (Based On Latest Technology) including all necessary hardware and software, OS, Database etc. required with complete in all respect and as per the technical specification mentioned with 3 years OEM warranty as per the requirement and as directed to the satisfaction of the engineer (Make - As per approved make)	HP/Dell	1	No						
57.13	Supply, installation, testing and commissioning of Backup Server (Based On Latest Technology) including all necessary hardware and software, OS, Database etc. required and should be connected with the main server in cluster mode with complete in all respect and as per the technical specification mentioned with 3 years OEM warranty as per the requirement and as directed to the satisfaction of the engineer (Make - As per approved make)	HP/Dell	1	No						
TOTAL										

LIST OF ITEMS & EQUIPMENT IN MORTUARY						
Item No. 1	Description 2	Unit 3	Qty 4	Rate In Rs (in Figure) 5	Rate in Words in Rupees 6	Amount (Rs.) (In Figure) 7
1.0	Mortuary (6-Body) including UPS Complete with all accessories as per technical specification	Nos	3			
2.0	Loading Trolley Complete with all accessories as per technical specification	Nos	3			
	Total Rs.					

LIST OF ITEMS & EQUIPMENT OF MINOR OT

Item No. 1	Description 2	Unit 3	Qty 4	Rate Rs. (In Figure) 5	Rate in words in Rupees 6	Amount 7 Rs
1.0	CEILING CONSTRUCTION Complete with all accessories as per technical specification	SQM	200			
2.0	CEILING FILTRATION SYSTEM / LAMINAR AIR FLOW SYSTEM (AIR MANAGEMENT SYSTEM) Complete with all accessories as required as per technical specification	Nos	6			
3.0	CORNER COVING Complete with all accessories as per technical specification	Mtr	225			
4.0	WALL PAINTING Complete with all accessories as per technical specification	SQM	430			
5.0	DOUBLE LEAF DOOR (2100 X 1500) mm Complete with all accessories as per technical specification	Nos	6			
6.0	PERIPHERAL LIGHT CUM CLEAN ROOM LUMINARIES -LED Complete with all accessories as per technical specification	Nos	48			
7.0	DISTRIBUTION BOARD ELECTRICAL WIRING, CONDUITING WITH FIXTURES INSIDE THE OPERATION THEATRE Complete with all accessories as per technical specification	Lot	6			
8.0	FLOORING (ANTISTATIC CONDUCTIVE ROLL) WITH SELF LEVELLING COMPOUND Complete with all accessories as required as per technical specification	SQM	230			
9.0	INTERNAL DUCTING Complete with all accessories as per technical specification	Lot	6			
10.0	MEDICAL GAS LINE INSTALLATION Complete with all accessories as per technical specification	Lot	6			
11.0	SCRUB STATION Complete with all accessories as required as per technical specification.	Nos	6			
12.0	X-RAY FILM VIEWER Complete with all accessories as per technical specification	Nos	6			
13.0	OT LIGHT DUAL DOME LED LIGHT (IMPORTED) Complete with all accessories as required as per technical specification. IMPORTED	Nos.	6			
	TOTAL Rs.					

LIST OF ITEMS & EQUIPMENT OF BIO-MEDICAL WASTE MANAGEMENT SYSTEM						
Item No. 1	Description 2	Unit 3	Qty 4	Rate In Rs (in Figure) 5	Rate in Words in Rupees 6	Amount in Rs. 7
1.0	Bio-medical Waste Autoclave of capacity 600 Ltrs including in-built Steam Generator.complete as required with all accessories as per specification	Nos	2			
2.0	Medical Waste Shredder (Low speed) of capacity 50 Kg/hr complete as required with all accessories as per specification	Nos	2			
3.0	Needle Destroyer complete as required with all accessories as per specification	Nos	100			
4.0	Waste Collection Containers of metal construction with synthetic enamel painting as per specifications. App.Size- 8"x10"x21";	Nos	100			
5.0	App.Size- 12"x14"x33";	Nos	100			
	App.Size-17"x14"x33"	Nos	20			
	Waste Collection bags as per specification App. Size 17"x25"	Nos	10000			
6.0	App. Size 25"x37"	Nos	10000			
	App.Size 36"x40"	Nos	1500			
	Transportation Trolley 100 Ltrs. Capacity complete as required with all accessories as per specification	Nos	20			
7.0	INDUSTRIAL WEIGHING MACHINE-Capacity 300 Kg Electronic machine with Digital display.Details of technical data are as per technical specification.	Nos	1			
				Total Rs.		

LIST OF ITEMS & EQUIPMENT OF CSSD						
Item No.	Description 2	Unit 3	Qty 4	Unit Rate In Rs (in Figure) 5	Unit Rate in Rs (in Words) 6	Amount (Rs.) (In Figure) 7
1.0	HORIZONTAL DOUBLE Sliding DOOR AUTOCLAVE WITH CARRIAGE AND TROLLEY, cap. 550-600 L Complete with all accessories as per detail technical specification.	Nos	4			
2.0	HIGH SPEED STERILIZER 150-250 L WITH ACCESSORIES Complete with all accessories as per detail technical specification.	Nos	3			
3.0	RAPID STERILIZER (FLASH AUTOCLAVE) 20-25 L Complete with all accessories as per detail technical specification.	Nos	8			
4.0	DOUBLE DOOR WASHER DISINFECTOR CAPACITY-300-350 L. Complete with all accessories as per detail technical specification.	Nos	2			
5.0	LOW TEMPERATURE STERILIZER (H2O2) Size-150L Complete with all accessories as per detail technical specification.	Nos	2			
6.0	ULTRASONIC CLEANER CAPACITY-40L Complete with all accessories as per detail technical specification.	Nos	2			
7.0	HEAT SEALING MACHINE Complete with all accessories as per detail technical specification.	Nos	2			
8.0	DRYING CABINET 275 L Complete with all accessories as per detail technical specification.	Nos	2			
9.0	SPRAY GUN RINSER Complete with all accessories as per detail technical specification.	Nos	2			
10.0	GAUZE CUTTING MACHINE Complete with all accessories as per detail technical specification.	Nos	2			
11.0	AIR COMPRESSOR Complete with all accessories as per detail technical specification.	Nos	2			
12.0	INSPECTION LAMP WITH MAGNIFIER Complete with all accessories as per detail technical specification.	Nos	1			
13.0	WASH STATIONS WITH 2 SINKS FOR DIRTY AREA Size Approx. (L x W x H) : 2000x750x850 mm Complete with all accessories as per detail technical specification.	Nos	2			
14.0	SS WORK TABLE SIZE-1200X650X900 Complete with all accessories as per detail technical specification.	Nos	6			

15.0	CONTROL & PACKING TABLE WITH TWO SHELVES FOR CLEAN AREA Complete with all accessories as per detail technical specification.	Nos	4			
16.0	LINEN FOLD TABLE FOR CLEAN AREA a. Size (LxWxH) : 2000x1400x900 mm approximately. Complete with all accessories as per detail technical	Nos	2			
17.0	WIRE STORAGE SHELF MODULE FOR DIRTY/DISINFECTION AREA/CLEAN/STERILE AREA Complete with all accessories as per detail technical specification	Nos	6			
18.0	PASS BOX Complete with all accessories as per detail technical specification.	Nos	3			
19.0	CLOSED TRANSPORT TROLLEY FROM STERILE STORE TO OT Size : 1400x750x1260 mm(LxWxH) (External) approximately Complete with all accessories as per detail technical specification.	Nos	10			
20.0	Table Trolley with 2 shelves 530x1080x800 H Complete with all accessories as per detail technical specification	Nos	6			
21.0	MODULAR STERILIZING BASKETS BIG Complete with all accessories as per detail technical specification.	Nos	50			
22.0	MODULAR STERILIZING BASKETS MEDIUM Complete with all accessories as per detail technical specification.	Nos	50			
23.0	BASKET RACK suitable to accommodate Baskets Complete with all accessories as per detail technical specification.	Nos	6			
24.0	STORAGE RACK 5 SHELVES 1830X535X1830 Complete with all accessories as per detail technical	Nos	14			
25.0	STAFF CHAIR Complete with all accessories as per detail technical specification.	Nos	2			
26.0	LAB STOOL WITHOUT BACKREST.(SS) Complete with all accessories as per detail technical specification.	Nos	8			
27.0	STORAGE CUPBOARD Complete with all accessories as per detail technical specification.	Nos	2			
28.0	WASTE BIN PEDAL OPERATED-SS Complete with all accessories as per detail technical specification.	Nos	2			

LIST OF ITEMS & EQUIPMENT OF INTEGRATION AND DATAMANAGEMENT SYSTEM OF MODULAR OPERATION THATRE						
Item No.	Description	Unit	Qty	RATE IN FIG in Rs	RATE IN WORDS in Rupees	AMOUNT in Rs.
1.0	DIGITAL DISPLAY MONITOR 26"- 32" Full HD Flat Panel Medical grade LED Complete with all accessories as per technical specification	Nos	4			
2.0	AUDIO-VISUAL COMMUNICATION SYSTEM Complete with all accessories as per technical specification	Nos	2			
3.0	CENTRAL CONTROL SYSTEM 19"-22" Full HD Flat panel LED Complete with all accessories as per technical specification	Nos	2			
4.0	FULL HIGH DEFINITION MEDICAL GRADE MONITOR 42"-46"OR MORE LED FOR IMAGE DATA MANAGEMENT SYSTEM Complete with all accessories as per technical specification	Nos	2			
5.0	CAMERA (PTZ) INSIDE OT'S Complete with all accessories as per technical specification	Nos	2			
					TOTAL Rs.	

LIST OF ITEMS & EQUIPMENT OF KITCHEN							
Sl.No1	Specifications	2	Size/Unit 3	Qty. 4	Rate in Rs in Fig 5	Rate in Words in Rupees 6	Amount in Rs. 7
CENTRAL KITCHEN							
1	Preparation Table with 1u/s- Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.		2000x600x850	1			
2	Wall Shelf - constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet		2000x600	2			
3	Single Burner Stock Pot- Top of 16 swg. S.S-304 Sheet on M.S Angle frame work duly rust proof painted on SS Tubular/ Square legs with adjustable bullet feet for uneven floors. Fitted with United/Sarna make heavy duty burner with pilot lamps with individual control valves and heavy duty cast iron pan support complete with accessories as per specification.		750x750x600	8			
4	Side Table- Same as sl.ni.1		1500x600x600	2			
5	Exhaust hood- Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease collection tray and hung/fixed with metal fasteners complete with accessories as per specification.		4800x2000x600	1			
6	Boiler (Tilting) - Double walled glass wool Insulated all S.S-304 Sheet body. The outer Most is of 18swg S.S-304 Sheet body. Fitted with heavy duty high pressure burner with pilot lamp & individual control valves. Fitted with water inlet & water outlet valve & strainer at the bottom level of the boiler also fitted with a Top opening lid with insulated handle. The entire boiler is mounted on heavy duty tubular legs. Also fitted with a heavy duty tilting gear to extract the boiled food complete with accessories as per specification.		150ltr.	2			
7	Brazing Pan (Tilting) - Double walled mineral wool insulated all S.S-304sheet body on heavy duty tubular legs with adjustable bullet feet. Fitted with heavy duty burner with pilot lamp with individual control needle valve. Fitted with tilting gear to extract contents after cooking & water inlet valve. Also fitted with top opening lid with insulated handle complete with accessories as per specification.		80 ltr.	2			
8	Exhaust Hood - Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease collection tray and hung/fixed with metal fasteners complete with accessories as per specification.		5400x1200x600	1			
9	Masala Trolley -The entire trolley is made on SS sheet body to keep inserts for preparation on tubular legs on 4 nos castor wheels-2 with breaks and 2 normal. Also fitted with a bottom shelf/cross brazings. Size-800 x 500 x 900		800x500x900	2			

10	Chapatti Plate cum puffer - Structure made of mild steel angle frame duly rust proof painted . Top of 12 mm mild steel, front Panel and under shelf 18swg S.S-304sheet, vertical legs of S.S-304 round pipe of 16swg. 1.5" diameter with nylon adjustable feet. Complete with CI perforated grill for puffing of chapattis, heavy duty high pressure RV burner pilot, individual control valves Indian Oil corporation approved complete with accessories as per specification.	1500x600x850	4			
11	Chapatti Rolling Table - Top made of 16swg S.S-304 sheet on MS Angle frame work with rust proof painted on S.S-304 square pipe 25x25mm/Tubular legs frame work and under shelf made of 18swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg. 1.5" dia with nylon adjustable feet complete with accessories as per specification.	1200x600x850	4			
12	Chapatti Making machine -L.P.G/PNG for heating Fully automatic, compact, single unit machine to produce home-like chapattis in most hygienic way. The machine should produce balls from dough, rolls them into chapattis, cooks them by turning sides on tawas and puffs them the way it is done at home. The machine produces soft & tasty chapattis without oil. Complete with accessories as per specification.	2000 Chapatti per hr	1			
13	Chapatti collection Trolley - Structure made of MS angle, duly rust proof painted Body completely constructed of S.S-304 sheet. Sunken top of 16 swg.S.S. Sheet on S.S tubular legs on heavy duty wheels- 2 with breaks & 2 normal complete with accessories as per specification.	750x600x850	4			
14	Exhaust hood - Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease collection tray and hung with metal fasteners complete with accessories as per specification.	1800x1500x600	2			
15	Work Table with sink - Top of 16 swg S.S-304 sheet on SS frame work on Structure made of S.S-304 square/Tubular pipe. Sink made of 14 swg S.S-304 on LHS/RHS and under shelf made of 18 swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg. 1.5" dia with nylon adjustable feet. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.	1200x600x850+150	2			
16	Side Table -Same as sl.ni.1.	1200x600x850	2			
17	Dough Kneader - Body completely constructed of heavy duty cast iron with gear box mounted on the top the mixing bowl of S.S-304 sheet 14 swg with S.S-304 arm to mix the dough and is operated electrically with heavy duty motor of 1 hp. Motor shall be S1 type of IS : 325 standard (Latest version) and of Kirloskar/NGEF/Siemens/ABB/GEC/ Crompton Greaves make complete with accessories as per specification..	25 kg.	2			
18	Garbage Cart - Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its basecomplete with accessories as per specification. Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			

PREPARATION AREA						
1	Preparation Table with 1u/s- Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.	1800x600x850+150	2			
2	Wall shelf- Shelf constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet	1800x300	2			
3	SS stand for Chopping blocks with boards- All S.S-304 sheet body to hold poly carbonate chopping boards-4Nos.complete with accessories as per specification.	600x600x850	4			
4	Vegetable Cutter- Table top ,Professional 3.5 lts bowl capacity professional grade food processor, mixture, grinder complete with SS 304 grade cutter S type blade, transperent lid, with handle , water proof control panel with off & on simple touch button.Variable speed, 300 - 3000 rpm selection, 420 AISI SS blade, powerful induction motor on ball bearing. safety device to operate only when cover is closed. Operationable on 220 volts, 50 Hz single phase,etc as required. provided with standard set of attachments /discs/ tools blades for cutting/ slicing/ shredding etc. MAKE : DITTO ELECTROLUX/HOBART/ CAPLAIN.	200 Kg/hr	1			
5	Potato Peeler- The heavy duty peeling drum is made of 18 swg. SS sheet on three nos tiny legs with adjustable bullet feet and a rotating disc of SS sheet being connected with heavy duty motor of S1 type of IS:325 standard, single/three phase . Also pasted with emery granules inside the drum and on rotating disc to peel and fitted with water inlet valve and aluminum casting/SS sheet our pour to extract peeled potatoes complete with accessories as per specification. Make-Robotcoupe/Sirman/Haudie	10 kg.	2			
6	SS Single Bowl Sink unit (Vegetable washing)- Top of 16 sg. SS sheet on S.S. Angle frame work on S.S square legs with adjustable bullet feet for uneven floors. Also fitted with a large sink on RHS. Also fitted with a back splash and under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. The bowl size 500x500x250	1500 x 650 x 850 + 150 spl.	2			
7	Garbage Cart- Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base complete with accessories as per specification.Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			
PANTRY/SPECIAL DIET						
1	Work table with sink- Top of 16 swg S.S-304 sheet on SS frame work on Structure made of S.S-304 square/Tubular pipe. Sink made of 14 swg S.S-304 on LHS/RHS and under shelf made of 18 swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg. 1.5" dia with nylon adjustable feet. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.	1500x600x850 +150	1			
2	Coffee/Tea Machine Dispensor- Double walled glass wool insulated all S.S-304 Sheet body. Fitted with 3.0 kw heating element with auto temp. controller & indicating lamp, water level indicator, Gun metal faucet one for water and another for milk complete with accessories as per specification..	250 cups/hr	2			
3	Preparation Table with 1u/s- Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.	2000x600x850	1			
4	Micro oven- Convectional, Complete with accessories as per specification.IFB/Equivalent	30 ltrs.	1			

5	Conveyor Toaster- Capacity 750 nos per hour. Power consumption should not be more then Arr 2.8 kwatt,220 volts, stainless steel table top model, should be based on belt speed inplace of heating temperature for toasting colour. stainless steel element. with variable speed. Should be able to work both sides either front or rear. stainless steel .supplied with all accessories & attachments. crumb tray /discharge tray should be provided. continous toasting with thermostatic setting.High quality components &accurate timer control.Unit size should eb arr. 455x355x415mm Complete with accessories as per specification. Make ; LINCAT (CT -10) /HATCO (TQ-800)HPA/CROMO	750 Slices/hr	1			
6	Sandwich Griller - Self balancing top double plate. plate descent adjustable by means of brass brakes, thermostatic controls with o deg c to 300 deg c temperature range with warning lights(=live/yellow= plate temperature).spring with anti breaking system.complete body with fixed joints.supplied with steel cleaning brush. Orion 2 (Italy) ARISTARCO/ PANINI/ SIRMAN	Double Griller	2			
7	Egg boiler- Double walled mineral wool insulated all SS Sheet body on SS legs with adjustable bullet feet. Fitted with 3.0 kw immersion type heating element with auto temperature controller and indicating lamps. Also fitted with a top opening lid with insulated handle and two insulated handles on either side to carry. Also fitted with water inlet, outlet valves & water level indicator complete with accessories as per specification.	120 pcs egg/cycle	1			
8	Milk boiler- Triple walled mineral wool insulated all SS sheet body on SS legs with adjustable bullet feet. The outer most wall and the second wall is mineral wool insulated and the other wall water proof and fitted with water inlet, outlet, over flow valves and water level indicator. Also fitted with 3.0 kw immersion type heating element with auto temperature controller and indicating lamps and a heavy duty gun metal faucet. A top opening lid with insulated handle is fitted . Also fitted with two nos, insulated handles on either sides to carry complete with accessories as per specification.	100 Ltrs.	1			
9	Water Boiler- Double walled mineral wool insulated all S Sheet body on SS legs with adjustable bullet feet. Fitted with 3.0 kw immersion type heating element with auto temperature controller and indicating lamps. Also fitted with a top opening lid with insulated handle and two insulated handles on either side to carry Capacity- 80 Ltrs.	80 Ltrs.	1			
10	Four Burner with Oven- Top of 16 swg. SS Sheet on M.S Angle frame work on SS Square legs with adjustable bullet feet for uneven floors. Fitted with United/Sarna make heavy duty burner with pilot lamps with individual control valves and heavy duty cast iron pan support. Also fitted with an electrically operated oven beneath. Size-950 x 950 x 850 + 150 Spl.	950 x 950 x 850 + 150 Spl.	1			
11	Exhaust hood- Complete frame work 20/22swg. Complete joints are air tight insulated weather proof mechanically painted on the Upper surface. S.S-304 filters complete with accessories as per specification.	5400x1200x600	1			
12	Idly Steamer- Doubled walled mineral wool insulated all SS sheet body on tiny tubular legs with adjustable bullet feet. Fitted with two nos immersion type heating element of 3.0 KW each with individual auto temperature controller and indicating lamps and SS hinges inside to keep detachable idly trays. Also fitted with water inlet, outlet valves and water level indicator. A front opening insulated door is fitted at the service side.120 Idlys.	120 pcs	1			
13	Juicer- Compact design- fits almost anywhere,under counters or worktables.		2			
14	Hand wash Unit- Splash as per Layout (Rear & against side wall) Front & free side marine edge. 350mm dia.x200mm High Die Pressed Sink complete with 38mm dia. C.P. Drain Waste Out let. 16 gauge S.S-304 wall brackets. Secured to top with Acorn nuts & Bolts & Bracket secured to wall with anchor fasteners. Rear & Both sides 20 gauge S.S-304. One Deck mounted Jackson Swivel type water mixer water faucet. Unit mounted 865mm AFF Size- 600x600x450.	600x600x450	1			
15	Garbage Cart- Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base complete with accessories as per specification.Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			

POT WASH						
1	Pot Rack-4shelves- The heavy duty 4 tiers rack are made of S.S-304 square pipe (38mm & 25mm) and duly welded with 4 nos. uprights on nylon adjustable feet for uneven floor complete with accessories as per specification.	1200X600X1650	2			
2	Pot Rack- All the shelves are S.S-304 Square/Round pipes on 4Nos Square/Round legs with adjustable bullet feet. All the joints are firmly welded and nicely grinded, polished and puffed to a smoother finish complete with accessories as per specification..	1200x450x1650	2			
3	Two Sink Pot Wash- The structure made of SS: 304 square pipe 25 x 25 mm Angle frame work duly rust proof painted. Top & sink made of 14 swg and under shelf made of 18 swg SS: 304. Vertical legs of SS: 304 round pipe of 16 swg. 1.5inch dia. With nylon adjustable feet. Sink Size- 600x600x450	1500x600x850+150	1			
4	Pot wash Sink- To be constructed with Brick and Cement (Masonry Work) finished with tiles	2000x1500x600	1			
5	Hot water Geyser- Horizontal	100 Ltrs.	1			
6	Garbage Cart- Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base complete with accessories as per specification.Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			
DISH WASH						
1	Dish Washer- Single Tank Rack conveyor type. 6 to 8 plates per rack, Cycle time 1.5 minutes.The position of Dish Washer i.e RHS/LHS depends on loading and unloading table (As per layout drawing) Make-Winter Halter/ Electrlux/Hobart with Drier	At least 155 Rack/hr	1			
2	Pre-rinse Jet spray- The spray unit to be fitted with hot & cold mixer. Imported		2			
3	Soiled Dish Landing Table with glass Rack with Garbage chute- The marine edged top made of 16 swg SS: 304 sheet on MS Angle frame work, duly rust proof painted & stud welded for stronger grip and cross bracing of 18 swg SS: 304 sheet. Vertical legs with nylon adjustable feet. A Garbage chute is provided on LHS & a glass is fitted on the D.L.T.	1500X800X850 +600	1			
4	Clean Dish Table- Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted & stud welded on SS. Tubular/square legs with adjustable bullet feet. Also fitted with SS slide out beneath to hold the plate/glass racks of 500 x 500 mm	900x800x850+150	1			
5	Wiping Table- Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted & stud welded on SS. Tubular/square legs with adjustable bullet feet. Also fitted with an under shelf of 18 swg. S.S. Sheet of 18 swg. With adjustable bullet feet.	1500x600x850	1			
6	Hot water Geyser- Horizontal	60 Ltrs.	1			
7	Bussing Trolley- The two tiers trolley is made of 18 swg. SS sheet on tubular/square legs on castor wheels with a push cart type handle. Fitted with cushion guard on all sides to prevent the damage during operation.	900x600x900	2			
8	Dish Storage Rack 5 tiers- All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability	900x450x1800	4			
9	Wall Shelf- Shelf constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet	900 x 300	2			
10	Clean Dish Rack- Entirely constructed of S.S-304 round pipe with verticals and slides of 1.5 inch and inside shelves S.S-304 sheet 18 swg. The rack with 5 tiers is mounted on four nylon adjustable feet.	900x450x1800	4			
11	Dish Wash Basket Trolley- Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted on tiny castor wheels. Fitted with a push cart type handle.	600x600x200	2			

12	Garbage Cart- Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base complete with accessories as per specification.Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			
SET-UP AREA						
2	SS Tray Cutlery Trolley- The entire is made of S.S. hinges on S.S. square uprights on castor wheels. Size- 375x500x850	900x600x850	2			
3	Preparation Table with 1 u/s- Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 1500 x 650 x 850 + 150 spl.	1500 x 650 x 850 + 150 spl	2			
4	SS Rack on Castors- All five shelves are made of 18 swg. SS sheet on 4 nos round / square legs with adjustable bullet feet. All the shelves are having "C" channel through to accommodate maximum load bearing ability. Size- 1300 x 450 x 1800	1300 x 450 x 1800	2			
5	Hot Bain Marie on Castors- Double walled mineral wool insulated all S.S. Sheet body is fitted with an immersion type heating element of 3.0 KW with auto temp. controller & indicating lamps on heavy duty castor wheels. Intergral with top & suitable to accommodate Six (6) 300mm high GN 1/1 PANS GN 1/1 food pans with lid to be supplied #16 SWG S/S sheet tank integral with work top of water counter Fully coved corner insulated with 50 mm thick tightly packed glass wool on the exterior and base of internal tank & sheathed with 20 SWG s/s sheet on exterior Bottom of tank sloped to left side with 40mm dia brass waste w/angle valve # 18 SWG s/s perforated false bottom with all sides turned down 40mm in 12 mm two (2) nos 3.0 KW electric heating elements clamped 25mm off the bottom complete with thermostat, on 0 off switch, red light and controls.	2250x675x850	4			
6	Hot Food Service Trolley- Double walled insulated with glass wool. Inner side made of 18swg & outer side made of 20 swg as Stainless steel 304 sheet with 4 no heavy duty Castor wheels (4"6" dia) with 2 wheels locking arrangement and push cart type handle constructed from ss pipe. Trolley has Immersion type 3Kw heating elements with auto temp. controller & indicating lamp with temp. Indicator to keep 5 Nos big round containers of 10 ltrs. capacity each and 2 more small containers of suitable capacities all with lids to keep food hot vegetable/soup/card etc. and one rectangular for container for to keep chapattis. Also fitted with one middle and bottom shelves with lockable door. Rubber cushion to be fitted at the corners to prevent damage during transportation complete with accessories as per specification..	1200x600x900	14			
7	Platform Trolley- The entire trolley is made of 16 swg. S.S. Sheet on M.S. Angle frame work, duly Rust proof painted on heavy duty castor wheels. The top to be stud welded with the frame for stronger grip. Also fitted with a push cart type handle & rubber cushion in front to avoid the damage during movement.	900x600x250	2			
8	Garbage Cart- Moulded Plastic container with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base complete with accessories as per specification.Make-Cambro/Nilkmal/Sintex/Supreme	Capacity-100 ltrs,	1			
STORE						
1	Dunnage Rack- Make Sintex/ Nilkamal/Supreme, Moulded type	900x600x250	4			
2	Weighing Scale Electronic (Digital) - Electronic weighing scales of standard make to weigh upto 300 kg. The certificate from Weights & Measures Dept. is to be attached with the machine, duly certifying the serial no. complete with accessories as per specification. Make- Atco/Sanchit	300kg	1			
3	Storage Rack with 5 tiers for Vegetable store- All shelves are made of 18swg S.S-304 sheet on 4 nos round/square legs with adjustable bullet feet. All the shelves are having "C" channel through to accommodate maximum load bearing ability complete with accessories as per specification.	900 x 450 x1800	6			
4	Two door Refer.- Two/ single door unit, 650 Lts capacity, temperature range -2 deg C to +10°C. External and internal in AISI 304 stainless steel. Complete as required with all accessories as per technical specification	650 ltrs.	1			
5	Four Door Refrigerator- 1410 lts ,-2deg C to +10 deg C, External and internal door and side panels in 304 AISI stainless steel. Complete as required with all accessories as per technical specification	1410 Ltrs,	1			

6	Four Door Freezer 1410 lts ,18 deg C to -22 deg C, External and internal door and side panels in 304 AISI stainless steel. External back and top panel in galvanized steel. High-density expanded polyurethane insulating foam, 70mm in thickness 4 half doors with lock and microswitch to switch off the fan when the door is opened. Built-in refrigeration unit; Cooling capacity 1800 (watt) ventilated operating mode; digital control; automatic defrost and evaporation of defrost water; external digital temperature display. Complete as required with all accessories as per technical specification	1410 Ltrs,	1		
7	Water Cooler with RO system - Structure made of mild steel angle frame duly rust proof painted. Body completely constructed of S.S-304 sheet double walled insulated with puf, Inner tank of 22 swg and outer of 20 swg S.S-304 sheet food grade. The water cooler is mounted on four S.S-304 tubular legs with S.S-304 bullet adjustable feet. Complete with compressor and condenser unit of Emerson/ Techumshah/Copeland/Danfoss make with automatic temperature controller and temp. Indicator complete with accessories as per specification. Make-Bluestar/Celfrost/Cibwal	250 ltr.	1		
8	Onian/ Potato Bin- The entire bin is made of S.S. wire meshed body on heavy duty castor wheels. Fitted with top opening lid and the inclined bottom to have a lockable door to extract.	900x600x750	4		
9	Cereal/Atta/Maida Bin- The entire bin made of 18 swg S.S-304 sheet on tiny caster wheels & with top opening lid.	900x600x750	4		
10	Cold Room- Room size- Temperature -0 to 4 degree centigrade Insulation: Panels 60mm thick PU at 40-42kg density,PCGI exposed exterior 0.5mm thick sheet,PCGI exposed exterior 0.5mm thick sheet, PCGI interior 0.5mm thick sheet, floor interior and exterior of 0.5mm thick PCGI exposed sheet, Ceiling exterior PCGI, interior PCGI Sheet 0.5mm.Vertical,Panels Joint with Cam lock coupling in Tongue & Groove arrangement. Thickness of PUF Panels (for Wall, Ceiling & Floor)- 60mm.Wall & Ceiling panels Finish- Internal: SS 304 External: PCGI Galvanized Ironic Sheet. Flooring- Kota stone by client. Density of Panels-40kg/cub.m No. of Doors- One for Main Room Type. of Doors- Over Lapped or Flash Type Door Size-900mm x 1950mm. Accessories Included in the scope of Supply-1. Door Alarm 2. Lock Defeat mechanism 3. Light Inside the cold room. 4. Handle, Hinges & Locks. 5. Microprocessor based digital control. Panels. 6. Panel Accessories & necessary Hardware. Technical Feature of PUF Panels, Doors, & Accessories: Individual Panel is manufactured with closed cell Rigid Polyurethane foam, injected at high pressure, which secures the bond with facing material to form a single piece construction. RPUF insulation is CFC free and has Zero ODP- Ozone Depleting potential. Core density of 40kg / Cu.M Panel finish is designed to resist many chemicals including most common cleaning agents. The panels have fire rating to BS.467 part 7, clause 1. Wall, floor & ceiling panels joined with Tongue and groove mechanism with cam lock system. The compressor and condenser unit of Emerson/ Techumshah/Copeland/Danfoss make with Automatic temperature controller and temp. Indicator complete with accessories as per specification. Make- Bluestar/Celfrost/Mothersonzonetti	4500X3000X2100	1		
11	Storage Rack 5 tiers- All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability complete with accessories as per specification.	900x450x1800	8		
12	Storage Rack 4tiers- All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability complete with accessories as per specification.	800x450x1200	3		
13	Insect killer- Twin tube. Make- Mitwaz/Pestokill	Branded.	6		
14	Air curtain -1 entry point Make-Mitwaz	Length as per drg.	2		
	LPG BANK				
1	LPG Bank- 20 + 20 (One set working another set standby) LPG Cylinder Bank of 14.2 Kg each LPG cylinder with :Class'C' seamless steel pipe conforming to IS:1239 (Latest version) with Pressure Gauges (0-15 PSIG & 0-5PSIG, dial type) Complete with accessories as required as per spacificification.	1 Lot	1		
				TOTAL Rs.	

LIST OF ITEMS & EQUIPMENT OF LAUNDRY

Item No.	Description 2	Unit 3	Qty 4	Unit Cost in Fig. Rs. 5	Unit cost in Words in Rupees 6	Amount in Rs. 7
1.0	Slucing cum Washer Extractor 60 Kg capacity Fully Programmable Microprocessor/Computer controlled. Steam heated. suitable for heavy duty continuous operation.Details of technical data are as per technical specification.	Nos	1			
2.0	Washer Extractor 60 Kg Fully Programmable Microprocessor/Computer controlled. Steam heated suitable for heavy duty continuous operation. Details of technical data are as per technical specification.	Nos	3			
3.0	Drying Tumbler 60 Kg heavy duty Programmable Logic Controlled. Steam heated. Details of technical data are as per technical specification.	Nos	3			
4.0	Flat Ironer Chest heated Roller Size-500 dia x 3000 L Details of technical data are as per technical specification.	Nos	2			
5.0	Flat bed press, Size- 1500mm x 750mm. Steam heated, Details of technical data are as per technical specification.	Nos	2			
6.0	Boiler –Non-IBR type, Capacity 850 Kg/hr. Steam Pressure-10.5 Kgf/sq.cm, LDO/HSD/FO fuel fired. Equipped with Water Softening Plant, PRV, Scrubber unit and Diesel Tank . with Pipelines, Pressure Gauges, Valves and other required accessories to connect to Boiler. Plug and unit. Details of technical data are as per technical specification.	Nos.	2			
7.0	Vacuum finishing table with Electric steam iron, Size- 1300mm x 800 mm. Details of technical data are as per technical specification.	Nos	3			

8.0	Air Compressor of 7.5hp of Ingersoll rand/Elgi/Kirloskar make. Details of technical data are as per technical specification.	Nos	1			
9.0	Automatic motorized sewing machine shall be heavy duty type. Details of technical data are as per technical specification.	Nos	2			
10.0	Wash Room Trolley Capacity 50 Kg. Stainless steel construction with tubes and bars. Fitted with 4 nos swivelling castor wheels. Details of technical data are as per technical specification.	Nos	6			
11.0	Dry Linen Trolley Capacity 50 Kg. Stainless steel construction with tubes and bars. Fitted with 4 nos swivelling castor wheels. Details of technical data are as per technical specification.	Nos.	6			
12.0	Mobile Table with Stainless table top. Size-1200mm x 750mm x 800 mm ht. 1800mm x 900mm x 800mm ht. with swiveling wheels. Details of technical data are as per technical specification.	Nos.	4			
13.0	Shelf Trolley Capacity -100 Kg. Stainless construction with tubes and bars. Fitted with 3 shelves and 4 nos swivelling type castor wheels. Details of technical data are as per technical specification.	Nos	3			
14.0	Laundry Scrub Station with 2 Sinks. Stainless Steel Construction. S.S Sinks with taps for wash and rinse using hot and cold water. SS Scrubbing Board in between Sinks. Underneath Shelf. Size-1600x500x900 ht. Details of technical data are as per technical specification.	Nos.	1			
15.0	Storage Rack (Size-1250mmx460mmx1800mm) 4 shelves, Stainless Steel Construction. Details of technical data are as per technical specification.	Nos	16			
16.0	Weighing Scale Electronic (Digital) - Electronic weighing scales of standard make to weigh upto 300 kg. The certificate from Weights & Measures Dept. is to be attached with the machine, duly certifying the serial no. complete with accessories as per specification. Make- Atco/Sanchit/Equivalent	Nos.	1			
				TOTAL Rs.		

LIST OF ITEMS & EQUIPMENT OF MEDICAL GAS PIPELINE SYSTEM

Sl.No.	Description of items	QTY	Unit	Rate in Rs.	Rate in Rupees in Words	Amount in Rs.
1.1	Fully Automatic Oxygen Control System : Supply, Installation testing and commissioning of Fully Automatic Oxygen Control System. As per specification	1	Nos			
1.2	Oxygen Manifold (2x20) : Supply, Installation, testing and commissioning of (2x20 size) class D cylinder Oxygen Supply System. As per specification	1	Nos			
1.3	Emergency Oxygen Supply System : Supply, Installation, testing and commissioning of (2x5 size) class D cylinder Emergency Oxygen Supply System. As per specification	1	Nos			
1.4	Oxygen Flow meter with Humidifier Bottle: Supply, installation, testing and commissioning of oxygen flow meter with humidifier bottle 0-15Litres. As per specification	848	Nos			
1.5	LMO Tank 20KL with Vaporiser and Pressure Reducing Stn:Supply, installation,testing and commissioning complete with all accessories as per specification	1	Nos			
2.1	Fully Automatic Manifold Control Panel for Nitrous Oxide: Supply, installation testing and commission of fully automatic control panel for Nitrous Oxide. As per specification	1	Nos			
2.2	Nitrous Oxide Manifold System, (2x6 size): Supply, installation, testing and commissioning of (2x6 size) Nitrous Oxide Manifold system .As per specification	1	Nos			
2.3	Emergency Nitrous Oxide Manifold System, 2x2 size: Supply, installation, testing and commissioning of (2x2 size) cylinder Emergency Nitrous Oxide supply System .As per specification	1	Nos			

3.0	Medical Air Plant (Package Unit) including electrical control panel: Supply, Installation, testing and commissioning medical air plant having a minimum capacity of 5660 LPM as Primary & 1500 LPM as standby or Total minimum Plant Capacity of 7160LPM and as per specification.	1	Nos			
4.0	Medical Vacuum Plant (Package unit): Supply, Installation, testing and commissioning of Rotary Vane type medical vacuum plant having a minimum capacity of 6230 LPM as primary and as standby and as per specification	1	Nos			
5.0	Ward Vacuum Unit: Supply, installation, testing and commissioning of Ward Vacuum Unit as per tender technical specifications.	784	Nos			
6.0	Theater Vacuum Unit for Operation Theaters: Supply, installation, testing and commissioning of Theater Vacuum Unit as per tender technical specifications.	48	Nos			
7.0	Duplex AGSS System: Supply installation and commissioning of Duplex AGSS system. As per specification	1	Nos			
8.0	Copper Pipes As per tender technical specifications					
i	76mm OD X 1.2mm thick	66	mtr			
ii	54mm OD X 1.2mm thick	264	mtr			
iii	42mm OD X 1.2mm thick	451	mtr			
iv	35mm OD X 1.2mm thick	1012	mtr			
v	28mm OD X 1 mm thick	2475	mtr			
vi	22mm OD X 1 mm thick	4785	mtr			
vii	15mm OD X 1 mm thick	4130	mtr			
viii	12mm OD X 1 mm thick	2934	mtr			

9.0	Gas Outlet Points/ Terminal Units with probe: Supply,Installation, testing and commissioning of Gas outlet points for Oxygen, Nitrous Oxide, Medical Air 4 Bar , Vacuum, CO2 and AGSS .					
i	Oxygen outlet with probe (MOT outlets are in the MOT Package)	784	Nos			
ii	Nitrous Oxide outlet with probe (MOT outlets are in the MOT Package)	2	Nos			
iii	Medical Air 4 outlet with probe (MOT outlets are in the MOT Package)	129	Nos			
iv	Vacuum outlet with probe (MOT outlets are in the MOT Package)	784	Nos			
v	Medical Air 7 outlet with probe (MOT outlets are in the MOT Package)	0	Nos			
vi	AGSS outlet with probe (MOT outlets are in the MOT Package)	2	Nos			
10.0	AREA VALVE BOX : Supply,Installation, testing and commissioning of Area Valve Boxes. as per specification					
	Valve Box - 2 Gas Service	18	Nos			
	Valve Box - 3 Gas Service	8	Nos			
	Valve Box - 6 Gas Service	18	Nos			
11.0	MEDICAL GAS ALARM PANEL : Supply, Installation, testing and commissioning of Medical Gas Alarm Panel.as per specification					
	Medical Gas Area Alarm for 2 services (Oxygen and MA4 bar)	18	Nos			
	Medical Gas Area Alarm for 3 services (Oxygen, MA4 bar and Vacuum)	8	Nos			
	Medical Gas Area Alarm 6 services (Oxygen, N2O, MA4 bar , SA7 bar N2O,and Vacuum)	18	Nos			
	Master Alarm Panel	1	Nos			
12.0	LINE ISOLATION VALVES					
	15 mm ball valve	109	Nos			

	22 mm ball valve	104	Nos			
	28 mm ball valve	4	Nos			
	35 mm ball valve	15	Nos			
	42 mm ball valve	11	Nos			
	54 mm ball valve	8	Nos			
	76 mm ball valve	2	Nos			
13.0	Supply of O2 cylinders-Class D cylinders	60	Nos			
14.0	Supply of N2O cylinders-Class D cylinders	20	Nos			
15.0	Supply of CO2 cylinders-Class D cylinders	10	Nos			
16.0	Bed Head Horizontal/ vertical Wall Panel (Without outlets) as per specification	140	Nos			
17.0	Supply installation testing and commissioning of Medical gas hose assemblies as per standard followed	500	mtr			
18.0	Electric wiring inside the gas manifold and plant room including electrical panel for plant & Manifold rooms	1	Nos			
19.0	CO2 Manifold 2 + 2 Primary & 1+1 Standby Cylinders with Automatic control panel as per specs	1	Nos			
						TOTAL Rs.

LIST OF ITEMS & EQUIPMENT MODULAR OT						
Item No.	Description	Unit	Qty	Rate in Fig in Rs.	Rate in Words in Rupees	Amount in Rs.
1.0	WALL & CEILING PANELING SYSTEM Complete with all accessories as per tender specification	SQM	1506			
2.0	PVC FLOORING (ANTISTATIC CONDUCTIVE ROLL) Complete with all accessories as per tender specification after using SELF LEVELLING COMPOUND	SQM	700			
3.0	LAMINAR AIR FLOW SYSTEM, EXHAUST CABINETS AND AC DUCTING (Inside MOT) AND EXHAUST CABINET Complete with all accessories as per tender specification	Nos	10			
4.0	PERIPHERAL LIGHTING AND CLEAN ROOM LUMINARIES Complete with all accessories as per tender specification	Nos	100			
5.0	TOUCH SCREEN CONTROL PANEL-Imported Complete with all accessories as per tender specification	Nos	10			
6.0	X-RAY FILM VIEWER Complete with all accessories as per tender specification	Nos	10			
7.0	STORAGE UNIT Complete with all accessories as per tender specification	Nos	10			
8.0	HATCH BOX Complete with all accessories as per technical specification	Nos	10			
9.0	PRESSURE RELIEF DAMPERS Complete with all accessories as per technical specification	Nos	10			
10A	HERMETICALLY SEALED DOOR (2100 X 1500mm) Complete with all accessories as per technical specification	Nos	10			
10B	HERMETICALLY SEALED DOOR (2100 X 1000mm) Complete with all accessories as per technical specification	Nos	10			
10C	VIEW WINDOW (With Motorized Blinds) Complete with all accessories as per technical specification	Nos	8			
11.0	OPERATING LIST BOARD Complete with all accessories as per technical specification	Nos	10			

12.0	SCRUB STATION Complete with all accessories as per technical specification	Nos	6			
13.0	ELECTRICAL INSTALLATION (Distribution Board, Internal wiring, cable tray, etc) Complete with all accessories as per technical specification	Nos	10			
14.0	A. OT LIGHT LED WITH B. HD CAMERA and HD LED FLAT PANEL MEDICAL GRADE MONITOR Complete with all accessories as per technical specification	Nos	10			
15.0	RECORDING SYSTEM Complete with all accessories as per technical specification	Nos	8			
16A	DOUBLE ARM MOVEABLE PENDANT FOR ANESHTHETIST Complete with all accessories as per technical specification	Nos	10			
16B	DOUBLE ARM MOVEABLE PENDANT FOR SURGEON Complete with all accessories as per technical specification	Nos	10			
17.0	MEDICAL GAS LINE INTERCONNECTION Complete with all accessories as per technical specification	Lot	10			
18.0	DIGITAL DISPLAY MONITOR Complete with all accessories as per technical specification	Nos	10			
						TOTAL Rs.

LIST OF ITEMS & EQUIPMENT OF PNEUMATIC TUBE SYSTEM

S.No.	Item Description	Qty	Unit	Rate in Rs.	Rate in words in Rs	Amount in Rs.
1	Supply, Installation, Testing and Commissioning of Control & Software System as per technical specification	1	No.			
2	Supply, Installation, Testing and Commissioning of Blower with VFD with attachment as per technical specification	3	Nos.			
3	Supply, Installation, Testing and Commissioning of front load Pass through station with RFID Reader Card as per technical specification	30	No.			
4	Supply, Installation, Testing and Commissioning of End station complete as per technical specification	1	No.			
5	Supply, Installation, Testing and Commissioning of Multi-Send station complete as per technical specification	1	No.			
6	Supply, Installation, Testing and Commissioning of Multi-Receive station complete as per technical specification	1	No.			
5	Supply, Installation, Testing and Commissioning of Diverter 160 mm, 3-Way, Air Tight, Microprocessor Controlled, With Touch Free Position and Tube Switches, Steel Housing. Provided with Optical Sensors as per technical specification.	7	Nos.			
7	Supply, Installation, Testing and Commissioning of Tubing material suitable for NW 160 mm system for the above items including the following (running metre):- 1.160mm dia UPVC tube grey complete with slide bend 2.Air tube 3.Transparent tube 4.Bends 5.Endpiece 6.Sleeve 7.Composite system cable 8.Mounting tools As per technical specification	800	Mtrs			
8	Supplying, installation, testing & commissioning of Carrier 160 mm with 2 programmable RFID tag for easy return of empty carrier. Inload size: 400x115. As per technical specification	55	Nos.			
9	Misc. Installation Accessories sourced from India, including: Pipe Clamps, Srew Bolts, Cable Clips, Hose Clamps & Baskets, Cushions and Racks for Stations	1	Job			
					TOTAL Rs.	

Annexure - A

LIST OF APPROVED MAKES: PLUMBING WORKS

Sl.No	Material	Relevant IS Code	MANUFACTURERS
1	Vitreous China Sanitary ware	2556	<i>Kohler, Roca, American Standards, TOTO, Falcon</i>
2	Vitreous China Sanitary ware - lower End	771	<i>Parryware, Hindware, Cera, Kohler, Roca, American Standards, TOTO, Falcon.</i>
3	Stainless Steel Sink		<i>Jayna, Neelkanth, Nirali, Selam Steel</i>
4	Plastic Seat Cover		<i>Kohler, Roca, American Standards, TOTO, Falcon</i>
5	Geysers		<i>Racold, Usha Lexus, Jaquar,</i>
6	C.P. Fittings Mixer/Pillar taps Washers, C.P. brass accessories ,CP Angle Valve, Bibcocks, CP waste	1795/4291/4 827	<i>Kohler, Roca, American Standards, TOTO,</i>
6(A)	C.P. Fittings Mixer/Pillar taps Washers, C.P. brass accessories ,CP Angle Valve, Bibcocks, CP waste ware - lower End	1795/4291/4 827	<i>Jaquar, Cera, Kohler, Roca, American Standards, TOTO,</i>
7	Centrifugally /Sand cast iron pipes & fittings	3989/1729	<i>Neco, SKF, HEPCO</i>
8	G.I. Pipes	1239 Part I	<i>Jindal-Hissar, Tata, Prakash-Surya</i>
9	G.I. Fittings	1239 Part I	<i>Unik, K.S., Zoloto,</i>
10	Gunmetal Valves	778	<i>Zoloto, Leader, Castle, Sant</i>
11	Brass stop & Bib Cock/Pressure Release valve	781	<i>Kohler, Roca, American Standards, TOTO, Falcon</i>
12	Ball valve with floats	1703	<i>Zoloto, Leader, Sant,</i>
13	Stoneware pipes & Gully Traps	651	<i>IS Marked pipes, as approved by Engineer</i>
14	R.C.C. pipes	458	<i>IS Marked pipes, as approved by Engineer</i>
15	C.I. Manhole Covers	1726	<i>SKF, Neco, BIC, HEPCO</i>
16	Water Tank		<i>Sintex,</i>
17	Mirror		<i>Atul, Modi guard, Asahi, Saint Gobain</i>
18	Hand drier		<i>Kopal, Euronics, Utech</i>
19	Insulation of Hot water pipes		<i>Vidoflex Insulation, Superlon, Thermaflex, Kaiflexkaimenn</i>
20	PVC Rain Water Pipes.		<i>Supreme, Prince, Finolex,</i>
21	D.I pipes		<i>Jindal, Tata, Electrosteel,</i>
22	Sluice valve / NRV		<i>Kilburn, Zoloto, Leader, L&T, Castle</i>

23	Water supply pumps		Crompton (CG), GRUNDFOS, KSB, Mather & Platt, Kirloskar
24	DI Manhole Cover		SKF,NECO,BIC,
25	Submersible pumps		GRUNDFOS, KSB, Mather & Platt, Kirloskar
26	PVC/UPVC pipes & fittings		Finolex , Prince, Supreme
27	Chlorinator		Siemens, Watcon, Ion exchange,
28	HDPE Solution tank		WATCON, ION EXCHANGE, Water Supply Specialist P (Ltd), Pollucon Technology
29	Infrared Sensor operated Faucets/Urinals		Kohler, Roca, American Standards, TOTO, Falcon
30	Gratings, Strainers, Cleanouts etc		Neer Brand (Sage Metals),ACO
31	Level controller		21st Century/ Advance Auto/ Shridhan international/ Minilec/ radar/ Femac/ Switzer
32	Drainage Pumps		Grundfos, KSB, Mather & Platt, Kirloskar
33	Water / Sewage Treatment Plant		Ion-Exchange, Pollucon Technologies, Thermax,
34	Decorative bath room fittings		Kohler, Roca, American Standards, TOTO, Falcon
35	R.O System		Ion-Exchange, Pentair, Pollucon Technologies, Thermax,
36	PE-AL-PE		Kitec, Jindal, PRINCE
37	HDPE pipes and fittings	IS:14333 (1996)	Oriplast, So-Soon, Finolex,
38	CPVC pipe, fittings and Solvent		Astral, Finolex, Ashirwad ,
39	Solar Panel		Maharshi Solar, Inter solar, EMMVEE SOLAR SYTEMS
40	Copper Pipe		Raj Co., Maxflow, Viega
41	Copper Fittings		Raj Co., Maxflow, Viega
42	Lab drainage		Viega, Duraline, So-Soon,
43	Lab Fittings		Viega, Duraline, So-Soon,
44	SS pipe(EN-10312) & press type fitting		Viega, Jindal
45	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside	IS:15905	Saint Gobain, Neco, HEPCO, SKF,
46	Oxilyte (Mixed Oxident)		Solutions, I2M Technologies, Faith Innovations

Note :

- Equivalent make of any item may be added with price adjustment with the approval of Engineer.
- Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of Engineer.
- **LIST OF APPROVED MAKES : FIRE FIGHTING WORKS**

Sl.No	Material	Relevant Code	ISI	MANUFACTURERS
1	G.I./M.S. Heavy class pipe	1239/3589		Jindal-Hissar, Tata, Surya- Prakash
2	Gate Air Valve			Leader, Zoloto, Castle, Sant
3	Butterfly valves	13095		Audco, KSB, C & R, Zoloto, Castle
4	Portable Fire Extinguisher	2171		Minimax, Safex, Ceasefire, Newage, Safe guard,
5	First aid Fire hose reels		884	Minimax, Safex, Ceasefire, Newage, Safe guard,
6	Fire hose pipes	636		Newage, Minimax, Safex, Ceasefire, Safe guard,
7	Fire Hydrant valves	5290		Minimax, Newage, Safex, Ceasefire, Safe guard
8	Sprinkler Heads			
A	Pendent type	IS		Tyco, Viking, HD, Grinnel,
B	Side wall type	IS		Tyco, Viking, HD, Grinnel,
C	Sprinkler Side wall extended through	IS		Tyco, Viking, HD, Grinnel,
9	Sluice and non return/ check valve foot valve strainer	IS		I.V.C., Kilburn, Zoloto, castle, Sant ,KSB
10	Thermoplastic fire hose pipe	1258		Minimax, safex, Newage, , Safe guard
11	Rubber hose 12/20mm dia			Dunlop, Good year, Jyoti Eversafe,
12	Reinforced rubber lined/canvas			Newage, Jayshree, Safe guard
13	Standby battery lead acid			Exide, Standard, Amco
14	Horizontal centrifugal/Fire pumps			Mather& platt(WILO), GRUNDFOS, Kirloskar.
15	Diesel engine			Cummins, Ashok Leyland, Caterpillar, Kirloskar
16	Electric motors			GEC, Siemens, NGEF, ABB, Crompton, Kirloskar
17	Electrical switch gear & starters			As per Electrical Works
18	Cables			As per Electrical Works
19	Flow meter			Scientific Equipment (P) Ltd. Hyderabad ,System Sensor /CPWD

20	Suction strainer		Leader, ZOLOTO, AUDCO, Castle
21	Vibration eliminator connectors		Resistoflex , Kanwal, D.wren
22	Single phase preventor		L & T, GEC, SIEMENS
23	G.I. Fittings	1239 Part I	Unik, K.S., Zoloto, R
24	Yard Hydrant Stand Post,4 way suction		Eversafe, Minimax, Newage, Safe guard
25	DI pipes		Jindal, TATA, Electrosteel,
26	Pipe coat material (Pipe protection)		<i>Pypkote Integrated water proofing co. Madras/ coaltek Rustech products (P) Ltd. Syndcate Enclave, Dabri/Makphall</i>
27	Fire Man's Axe		<i>Safeguard/safex/Newage/Gunnebo, Getech</i>
28	Pressure guage		<i>IS:C3624 (cl-1) H.GURU/Fiebig/BRC/HD</i>
29	Flow switch		<i>Potter/Safex system sensor/Jhonson control/Rapid flow</i>
30	Pressure switch		<i>Indfoss/switzer, Equivalent make approval of Engineer</i>
31	Fire suppression system		<i>SVS Buildwel (p) ltd , Equivalent make approval of Engineer,</i>

Note :

- Equivalent make of any item may be added with price adjustment with the approval of Engineer.
- Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of Engineer

ELECTRICAL WORKS(NON SCHEDULE ITES) FOR CONSTRUCTION OF HOSPITAL AND MEDICAL COLLEGE AT CHANDRAPUR, MAHARASHTRA			
S. No.	Item No.from BOQ	Items	Approved Makes
1	1.xx	33kV HT Panel Board	Siemens/L&T/ABB/Schneider
2	1.xx	11 kV HT Panel Board	Siemens/L&T/ABB/Schneider
3	1.xx	33/11kV Transformers	ABB/GE/ Schneider/Alstom
4	1.xx	11/.433kV Transformers	ABB/GE/ Schneider/Alstom
5	1.xx	Busduct	L&T/ABB/Siemens/Schneider/GE/ Legrand/C&S
6	1.xx	Safty Equipments	reputed
7	1.xx	HT Cables	CCI/Universal/Finolex/Rallison
8	1.xx	Cable Trays	CCI/Universal/Finolex/Rallison
9	1.xx	HT APFC Panel	Siemens/L&T/ABB/Schneider
10	2.xx	Mian LT Panels	Siemens/ L&T/ABB/Schneider
11	2.xx	APFC Panels	Siemens/ L&T/ABB/Schneider/EPCOS, Ducati
12	2.xx	AHF	Siemens/ L&T/ABB/Schneider/EPCOS, Ducati
13	2.xx	ACB	L & T 'U' Power(Omega)/ Siemens 3WL/ ABB/ Legrand(DMX)/ Schneider (NW- Master Pact)
14		Moulded Case Circuit Breake	L & T – (D sine/DL) / Siemens-VA/ ABB-TMA/ Schneider – (NSX/NS/CVS) /Legrand-DPX
15	3.xx	DG Sets and Synchronization Panel	Diesel Engine:Cummins/ Caterpillar/MTU/ Perkins- Sterling Alternator:Stamford/AVK/ Leroysoner/ KEC,Synchronization Panel/AMF:OEM of the DG set or Siemens/ L&T/ABB/Schneider
16	3.xx	Under Ground Diesel Tank	
17	4.xx	Rising Mains, Tapoff box and end feed unit	L&T/ABB/Siemens/Schneider/GE/ Legrand/C&S
18	5.xx	MV Panels	Tricolite/Adlec./Sterling &Wilson / Control & Switchgear/Nitya Electro Control Pvt. Ltd./Zeta/SPC Electrotech/Neptune
19	6.xx	UPS	Schneider- MG , APC/ Eaton Power ware/ Emerson
20	8.xx	Socket outlets	Legrand-Myrius or Anti bacterial/L&T Oris/Schneider -Livia / Philips -Sleek
21		Copper conductor PVC insulated wires, Co-axial , Telephone wires & cables	L&T/ Batra Henlay/ Bonton/
22	6.xx	MCB-DBSs	L &T/Hager/Legrand/ Siemens/ Schneider/GE / Philips
23	8.xx	MCCBs in Sheet steel encloser	L & T – (D sine/DL) / Siemens-VA/ ABB-TMA/ Schneider – (NSX/NS/CVS) /Legrand-DPX
24	8.xx	PIR sensors	Philips/ Honeywell/ Schneider/Lutron/Legrand
25	9.xx	Light Fixtures	Philips / GE/ Crompton Greaves
26	9.xx	Ceiling Fan, Exhaust Fan	Crompton Greaves/ Orient/ Usha
27	10.xx	EPABX System	Avaya/ Siemens-unify/Alcatel/Cisco
28	10.xx	Telephone Handsets	Avaya/ Siemens-unify/Alcatel/Cisco
29	13.xx	Addressable fire alarm system & Annunciators	Honeywell-Notifier/Edward/Bosch/ Siemens
30	14.xx	Outdoor PA system	Bosch/ Bose/ Honey well /Harman
31	15.xx	CCTV System	Pelco /Bosch/Sony/Axis
32	15.xx	LCD/LED Monitor	Sony/Panasonic/Samsung/ Toshiba
33	16.xx	Nurse Call Bell System	Honeywell/Schreak/ Rauland/Omnitech/Daksh
34	17.xx	Lifts	Otis /Kone/ Mitsubishi/ Scheindler/Johnson
35	18.xx	LT Cables	CCI/Universal/Finolex/Rallison
36	19.xx	Chemical Earthing	OBO Bettermann / Erico/Furse / Ingesco
37	21.xx	Audio Visual System	AV:Make- Bosch / JBL/ EV, Projector:Make- SONY / BARCO//CHRISTIE
38	22.xx	Lighting Control System	Lutron/ Philips/ ABB/ Schneider/ Legrand
39	23.xx	Access Control System	Honeywell-Pro-3000/Schneider/Lenel/Cardex
40	24.xx	Outdoor Lighting Poles	Philips / GE/ Crompton Greaves
41	25.xx	Solar Photovoltaic Power Generation	TATA Power Solar, CEL, BHEL, BEL

DETAILED SPECIFICATIONS

SYSTEM DESIGN DATA

1.0 GENERAL

The system design, basis of design, estimated requirements and other relevant data are outlined in this section.

2.0 LOCATION

Proposed Hospital & Medical college at Chandrapur, Maharashtra.

3.0 SCOPE OF WORK

3.1 The work proposed under this tender includes supply, installation, testing & commissioning of Central Air-conditioning systems for the Proposed Hospital & Medical College as detailed in the technical specifications and schedule of prices.

4.0 BASIS OF DESIGN

4.1 Assumptions

Following assumptions have been made for calculation of air-conditioning cooling load:

- a) Fresh air : As per ASHRAE 170 and 62.1.
- b) Window glazing : Single/double pane glass
- c) Lighting load : 1.1 W/ Sq. ft
- d) Occupancy : As per attached table / as per seating plan.
- e) Equipment load : As per attached Table /as per medical equipment.
- f) Roof Insulation : The exposed roof of air-conditioned areas shall be insulated by other agencies.

All non AC areas in corridors and lobbies where ducts are crossing/return being taken to have 50 mm thick insulated boxing.

- g) Electrical power supply: 415v/3ph/50Hz, AC power supply
- h) Humidity control : Not considered
- i) Glass : SHGC- 0.25
U-Value- 0.55 Btu/hr/sq F

j) Wall : U-Value 0.36 Btu/hr/sq F

4.2 Design Considerations :

- All the equipments etc. shall be suitable for 415 V, three phases or 220 V, Single phase, 50 Hz A.C. supply.
- Energy efficient chillers, VF drive for motors, Insulation of roof for reducing heat ingress & reducing load on AC, Double glazing of windows on sun facing side, Air tight windows and doors for reducing leakage of air and dust.
- All HVAC equipments and systems shall comply with the mandatory provisions of ECBC, 2007.
- Natural ventilation shall comply with the design guidelines provided for natural ventilation in the National Building Code of India 2016.
- Cooling equipments shall meet or exceed the minimum efficiency requirements laid down in ECBC, 2007.
- Where ever used, the Unitary Air conditioners will meet IS 1391 (part-I), split air conditioner shall meet IS 1391 (Part –II), Packaged air conditioner shall meet IS 8148.
- All cooling towers will have VFD controlled motors controlling the fans as prescribed in ECBC, 2007.
- All HVAC system will be balanced in accordance with provision of ECBC, 2007.

4.3 OUTSIDE AMBIENT CONDITIONS

Season	Dry Bulb temp	Wet Bulb temp.
SUMMER:	112 deg F DB	76 deg F WB
MONSOON:	85 deg F DB	81 deg F WB
WINTER:	60 deg F DB	52 deg F WB

INSIDE CONDITIONS

For All areas	74+/- 2 deg F & RH not exceeding 55%.
For OTs	70 +/- 2 deg F DB & RH not exceeding 50%.
For ICU	72+/- 2 deg F DB & RH not exceeding 50%.

5.0 ESTIMATED LOAD

HEAT LOAD SUMMARY OF CHANDRAPUR, MAHARASHTRA										
Sl. No	Space	Area (ft ²)	Ht. (Ft.)	Occupancy (Nos.)	Equipment Load (KW)	Fresh Air (CFM)	Estimated Loads			
							Summer (TR)	Monsoon (TR)	Winter (KW)	CFM
	HOSPITAL BLOCK									
	BASEMENT FLOOR									
1	CSSD	2986	12.50	4	0.25	1244	9.56	10.49	-2.00	2656
	GROUND FLOOR									
1	ROOM_1A	172	12.5	4	0.25	71.73	1.28	1.16	-0.03	469
2	OFFICE_1Ato1D	689	12.5	16	1	286.93	5.03	4.61	-0.03	1828
3	ROOM_1E	172	12.5	4	0.25	71.73	1.50	1.27	-0.19	575
4	ROOM_1Fto1H	516	12.5	12	0.75	215.20	2.51	2.67	0.45	764
5	ROOM_1I	172	12.5	4	0.25	71.73	1.16	0.98	0.02	409
6	CORRIDOR_1	990	12.5	15	0	412.47	4.20	4.24	-0.34	1247
7	MINOR_OT_1	301	12.5	6	3	313.83	4.94	4.96	0.63	2428
8	WAITING_1	495	12.5	20	0.25	340.00	3.56	3.72	-0.04	1003
9	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
10	ROOM_2A	258	12.5	4	0.25	107.60	1.42	1.38	-0.07	480
11	ROOM_2B	258	12.5	4	0.25	107.60	1.42	1.38	-0.07	480
12	STORE_2	495	12.5	4	1	206.23	3.35	3.00	-0.33	1260
13	Nurse_2	129	12.5	4	0	68.00	0.65	0.73	0.01	171
14	Doctor_2	129	12.5	4	0.25	68.00	0.76	0.83	0.14	221
15	Triage_Area	5918	12.5	4	3	2465.83	23.85	23.38	-4.74	7656
16	ULTRA_4a	260	12.5	3	2	108.32	2.18	2.17	0.81	856
17	ULTRA_4b	250	12.5	3	2	104.03	2.15	2.13	0.82	844
18	ECG_4	229	12.5	3	1	95.29	1.65	1.63	0.32	618
19	XRAY_4a	300	12.5	3	3	125.15	2.76	2.74	1.28	1106
20	XRAY_4B	503	12.5	3	3	209.65	4.36	4.04	0.67	1746
21	OFFICE_4	274	12.5	5	0.25	114.35	1.60	1.50	-0.09	549
22	CHANGE_ROOM_4 A	138	12.5	3	0.25	57.64	0.96	0.88	-0.01	346
23	CHANGE_ROOM_4 B	91	12.5	3	0.25	51.00	0.58	0.64	0.14	174
24	CHANGE_ROOM_4 C_4D	216	12.5	5	0.25	90.12	1.62	1.41	-0.16	593
25	UPS_ROOM_4	233	12.5	2	5	97.09	3.19	3.13	2.38	1366
26	MRI_4	535	12.5	4	8	222.82	6.16	5.86	3.37	2582

27	CONSOLE_ROOM_4A	132	12.5	2	6	54.87	3.22	3.11	3.05	1443
28	CONSOLE_ROOM_4B	123	12.5	2	6	51.12	3.17	3.08	3.07	1429
29	CT_SCAN	527	12.5	5	5	219.68	4.42	4.27	2.24	1742
30	MAMO	161	12.5	2	1	67.22	1.02	1.07	0.48	367
31	FLUROS	162	12.5	2	1	67.51	1.02	1.07	0.48	368
32	WAITING_AREA	3013	12.5	45	1	1255.33	18.00	19.50	-0.29	3603
33	1_CORRIDOR_J	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
34	BLOOD_BANK	1991	12.5	8	1	829.42	9.25	8.75	-1.57	3105
35	LAB	1991	12.5	15	2	829.42	10.02	9.52	-0.78	3406
36	CAFETERIA	6994	12.5	150	2	2914.17	34.23	34.15	-0.84	10577
37	CONSULTANT_7Ato7E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
38	CONSULTANT_7F	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
39	CONSULTANT_7L	172	12.5	4	0.25	71.73	1.57	1.28	-0.17	606
40	CONSULTANT_7Gto7K	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
41	CONSULTANT_7M_7N	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
42	CONSULTANT_7O_7P	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
43	WAITING_7	4810	12.5	90	1	2004.05	21.95	22.63	-0.86	6635
44	TEACHING_6A	495	12.5	20	1	340.00	4.37	4.26	0.04	1390
45	OPD_STORE_6A	172	12.5	4	1	71.73	1.87	1.46	0.20	753
46	OPD_STORE_6b	172	12.5	4	1	71.73	1.87	1.46	0.20	753
47	Doc_Room_6a	172	12.5	4	1	71.73	1.87	1.46	0.20	753
48	TREATMENT_6A	172	12.5	4	0.5	71.73	1.51	1.25	-0.07	580
49	Procedure_Room_6	495	12.5	10	1	206.23	3.38	2.95	0.04	1214
50	TEACHING_6B	495	12.5	20	1	340.00	3.88	4.04	0.35	1154
51	OPD_NURSE_6A_6B_DOCTOR	516	12.5	6	0.5	215.20	2.11	2.27	0.10	628
52	1_CORRIDOR_6	775	12.5	15	0	322.80	3.15	3.39	-0.02	877
53	1_MINOR_OT_6	301	12.5	15	3	313.83	4.48	4.81	1.27	2002
54	CORRIDOR_6A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
55	1_CORRIDOR_K	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
56	CONSULTANT_9Ato9E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
57	CONSULTANT_9F	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
58	OPD_9A_9B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
59	CONSULTANT_9K	172	12.5	4	0.25	71.73	1.93	1.47	-0.36	780
60	CONSULTANT_9Gto9I	516	12.5	12	1	215.20	4.38	3.64	-0.34	1663
61	ROOM_9A_9B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
62	WAITING_9	4605	12.5	80	1	1918.87	26.00	27.00	-1.31	6594
63	OPD_STORE_8A_8B	344	12.5	4	0.5	143.47	2.05	1.84	-0.20	727

64	TREATMENT_8A_8 B	344	12.5	4	0.5	143.47	2.05	1.84	-0.20	727
65	TEACHING_8A	495	12.5	20	1	340.00	4.37	4.26	0.04	1390
66	DOCTOR_8Ato8C	516	12.5	6	0.5	215.20	2.11	2.27	0.10	628
67	CORRIDOR_8	850	12.5	15	0	354.18	3.38	3.65	-0.08	942
68	MINOR_OT_8	301	12.5	15	3	313.83	4.48	4.81	1.27	2002
69	CORRIDOR_8A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
70	1_CORRIDOR_L	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
71	ENTRANCE_LOBBY	4638	25	50	2	3864.63	30.97	33.14	-9.44	8506
72	HELP_DESK	11029	12.5	50	1	4595.42	41.47	41.82	-7.73	12435
	FIRST FLOOR									
1	1_CONSULTANT_2 K	172	12.5	4	0.25	71.73	1.50	1.18	-0.17	572
2	1_CONSULTANT_2 Gto2I	516	12.5	12	1	215.20	3.29	2.97	0.32	1139
3	1_OPD_2A_2B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
4	1_DENTAL_sURGER Y_2A	172	12.5	4	0.5	71.73	0.94	1.00	0.28	305
5	1_DENTAL_PROST HETIC_2A	172	12.5	4	0.5	71.73	0.94	1.00	0.28	305
6	1_WAITING_1	4605	12.5	80	1	1918.87	21.27	21.37	-1.31	6531
7	1_PFT_LAB_1	242	12.5	4	1.5	100.88	2.43	2.04	0.43	976
8	1_BRONCHOSCOPY _1	172	12.5	4	1.5	71.73	1.78	1.67	0.66	706
9	1_OPD_STORE_1A _1B	344	12.5	4	1.5	143.47	2.73	2.52	0.36	1057
10	1_TREATMENT_1A _1B	344	12.5	4	1	143.47	2.53	2.32	0.10	957
11	1_TEACHING_1A	495	12.5	20	1	340.00	4.72	4.56	0.04	1558
12	1_TEACHING_1B	495	12.5	20	1	340.00	3.88	4.04	0.35	1154
13	1_DOCTOR_1Ato1C	516	12.5	6	0.5	215.20	2.11	2.27	0.10	628
14	1_CORRIDOR_1	990	12.5	15	0	412.47	3.81	4.12	-0.19	1061
15	1_MINOR_OT_1	301	12.5	15	3	313.83	4.48	4.81	1.27	2002
16	1_CORRIDOR_1A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
17	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
18	1_ROOM_3A	301	12.5	4	0.25	125.53	2.24	1.77	-0.40	845
19	1_PAC_CLINIC_3	172	12.5	4	0.25	71.73	1.25	1.15	0.00	455
20	1_OPD_STORE_3	172	12.5	4	0.5	71.73	1.36	1.26	0.13	505
21	1_TREATMENT_3A _3B	344	12.5	4	1	143.47	2.53	2.32	0.10	957
22	1_TEACHING_3A	495	12.5	20	1	340.00	4.72	4.56	0.04	1558
23	1_TEACHING_3B	495	12.5	20	1	340.00	3.88	4.04	0.35	1154
24	1_DOCTOR_3A_3B	344	12.5	6	0.5	143.47	1.57	1.68	0.23	481
25	1_SOUND_PROOF_ 3	344	12.5	3	0.5	143.47	1.43	1.53	0.11	437
26	1_CORRIDOR_3	990	12.5	15	0	412.47	3.81	4.12	-0.19	1061
27	1_MINOR_OT_3	301	12.5	15	3	313.83	4.48	4.81	1.27	2002

28	1_CORRIDOR_3A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
29	1_CORRIDOR_J	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
30	CONSULTANT_4Ato4E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
31	CONSULTANT_4F	172	12.5	4	0.25	71.73	1.49	1.18	-0.17	569
32	1_CONSULTANT_4L	172	12.5	4	0.25	71.73	1.50	1.18	-0.17	572
33	1_CONSULTANT_4Gto4K	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
34	1_OPD_4A_4B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
35	1_CONSULTANT_4M_4N	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
36	1_WAITING_2	4810	12.5	90	1	2004.05	21.82	22.40	-0.86	6572
37	1_OFFICES_5ato5d	473	12.5	12	1	204.00	2.51	2.67	0.60	779
38	1_OFFICES_5Eto5F	237	12.5	12	0.5	204.00	2.34	2.37	0.08	699
39	1_CONFERENCE_5	516	12.5	20	0.5	340.00	3.68	3.84	0.11	1057
40	1_HOD_ROOM_5	334	12.5	4	0.5	138.98	2.47	2.09	-0.28	939
41	1_ROOM_5X	172	12.5	2	0	71.73	1.20	1.06	-0.27	447
42	1_WARD_5	5111	12.5	50	4	2129.58	25.56	24.14	-3.05	8559
43	CONSULTANT_7Ato7E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
44	1_CONSULTANT_7F	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
45	1_CONSULTANT_7L	172	12.5	4	0.25	71.73	1.57	1.28	-0.17	606
46	1_CONSULTANT_7G_7K	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
47	1_OPD_7A_47B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
48	1_CHILD_4M_BABY_4N	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
49	1_WAITING_3	4810	12.5	90	1	2004.05	21.95	22.63	-0.86	6635
50	1_CANCER_DETEC_6	242	12.5	4	1.5	100.88	2.30	1.91	0.41	913
51	1_ultrasound_6	172	12.5	4	1.5	71.73	1.65	1.54	0.63	645
52	1_starility6_Family_Welfare_6	344	12.5	6	1.5	143.47	2.56	2.36	0.40	956
53	1_TREATMENT_6A_6B	344	12.5	4	1	143.47	2.26	2.05	0.06	827
54	1_TEACHING_6A	495	12.5	20	1	340.00	4.37	4.26	0.04	1390
55	1_TEACHING_6B	495	12.5	20	1	340.00	3.88	4.04	0.35	1154
56	1_DOCTOR_RECORS_STORE_7	516	12.5	6	0.5	215.20	2.11	2.27	0.10	628
57	1_CORRIDOR_6	990	12.5	15	0	412.47	3.81	4.12	-0.19	1061
58	1_MINOR_OT_6	301	12.5	15	3	313.83	4.48	4.81	1.27	2002
59	1_CORRIDOR_6A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
60	1_CORRIDOR_K	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
61	CONSULTANT_9Ato9E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
62	CONSULTANT_9F	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603

63	1_OPD_9A_9B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
64	1_CONSULTANT_9K	172	12.5	4	0.25	71.73	1.93	1.47	-0.36	780
65	1_CONSULTANT_9Gto9I	516	12.5	12	1	215.20	4.38	3.64	-0.34	1663
66	1_ROOM_9A_9B	344	12.5	8	0.5	143.47	1.67	1.78	0.30	510
67	1_WAITING_4	4605	12.5	80	1	1918.87	21.40	21.60	-1.31	6594
68	1_OPD_STORE_8A_8B	344	12.5	4	0.5	143.47	2.05	1.84	-0.20	727
69	1_TREATMENT_8A_8B	344	12.5	4	0.5	143.47	2.05	1.84	-0.20	727
70	1_TEACHING_8A	495	12.5	20	1	340.00	4.37	4.26	0.04	1390
71	1_DOCTOR_8Ato8C	516	12.5	6	0.5	215.20	2.11	2.27	0.10	628
72	1_CORRIDOR_8	850	12.5	15	0	354.18	3.38	3.65	-0.08	942
73	1_MINOR_OT_8	301	12.5	15	3	313.83	4.48	4.81	1.27	2002
74	1_CORRIDOR_8A	172	12.5	3	0	71.73	0.68	0.74	-0.02	190
75	1_CORRIDOR_L	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
76	HELP_DESK	11029	12.5	50	1	4595.42	45.60	46.30	-7.73	12435
	SECOND FLOOR									
1	2_DEMO_ROOM	497	12.5	12	1	207.13	3.87	3.38	0.11	1428
2	2_SR_DOCTOR_1	241	12.5	3	0.25	100.43	1.26	1.22	-0.07	426
3	2_SR_DOCTOR_2	249	12.5	3	0.25	103.57	1.45	1.37	-0.10	513
4	2_RECORDS	497	12.5	6	0.5	207.13	2.91	2.75	-0.20	1025
5	2_HOD	339	12.5	4	0.5	141.23	2.64	2.24	-0.36	1013
6	2_PS_ROOM	65	12.5	2	0.25	34.00	0.59	0.51	0.07	213
7	2_STUDENT_RM	116	12.5	4	0.25	68.00	0.74	0.82	0.14	212
8	2_JR_DR_ROOM_1a	124	12.5	3	0.25	51.78	0.64	0.68	0.15	200
9	2_JR_DR_ROOM1b	124	12.5	3	0.25	51.78	0.64	0.68	0.15	200
10	1_Routine_lab	134	12.5	6	0.5	102.00	1.53	1.37	0.08	522
11	1_ASSIS_ROOM	134	12.5	3	0.25	55.71	0.67	0.71	0.14	208
12	1_ASSIS_ROOM_1b	116	12.5	3	0.25	51.00	0.62	0.67	0.15	193
13	2_CORRIDOR_1	1229	12.5	25	0	512.09	6.00	5.71	-0.37	1864
14	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
15	2_DR_DUTY_ROOM_2	248	12.5	4	0.5	103.45	1.63	1.39	0.05	589
16	2_TREATMENT_RM_2	275	12.5	4	1	114.59	1.47	1.56	0.47	493
17	2_NURS_ROOM_2	252	12.5	4	0.25	105.04	1.08	1.16	0.09	323
18	2_STORE_2	124	12.5	3	0.25	51.78	0.64	0.68	0.15	200
19	2_CU_2	134	12.5	2	0.25	55.71	0.84	0.73	0.02	301
20	2_ROOM_1	131	12.5	3	0.25	54.45	0.88	0.77	0.06	313
21	2_ROOM_2	131	12.5	3	0.25	54.45	0.88	0.77	0.06	313
22	1_WARD_1	5046	12.5	45	3	2102.68	22.47	22.44	-2.23	7161
23	2_ICU_2	7574	12.5	45	15	3155.83	41.18	49.38	1.32	14966
24	2_ICU_1	3950	12.5	25	8	1645.74	23.09	27.36	0.56	8655

25	2_STOR_a	236	12.5	3	0.5	98.45	1.32	1.23	0.11	455
26	2_DOCTOR_RM_a	267	12.5	4	0.5	111.37	1.24	1.32	0.21	386
27	2_CU_a	138	12.5	2	0.25	57.30	0.86	0.74	0.01	308
28	2_TREATMENT_RM_a	260	12.5	4	1	108.14	1.42	1.50	0.48	480
29	2_DOC_DUTY_RM_b	234	12.5	4	0.5	97.62	1.34	1.27	0.15	458
30	2_NURSE_DUTY_RM_a	234	12.5	4	0.25	97.62	2.24	1.90	-0.29	891
31	2_PANTYRY	63	12.5	2	0.25	34.00	0.75	0.56	0.01	289
32	2_UTILITY	97	12.5	2	0.25	40.45	0.67	0.58	0.07	242
33	2_WARD_2	5434	12.5	45	8	2264.08	27.65	26.76	-0.71	9405
34	2_PRE_OP_1	1765	12.5	20	3	735.27	9.85	9.02	-0.04	3422
35	2_POST_OP_1	1388	12.5	20	3	578.35	8.25	9.75	0.76	2996
36	2_ANEST	172	12.5	3	0.5	71.73	1.46	1.20	0.08	600
37	STERILE_COR_5	2346	12.5	15	0.5	977.37	9.23	9.95	-0.91	2732
38	Corridor_2	1625	12.5	15	0	676.98	8.51	7.98	-1.89	2979
39	Corridor_3	2281	12.5	15	0	950.47	9.54	10.04	-1.43	2955
40	2_DOCT_RM_7	256	12.5	3	0.5	106.64	1.15	1.23	0.18	362
41	2_nurse_rm_7	249	12.5	4	0.25	103.63	1.65	1.46	-0.22	597
42	2_PREP_ROOM_7	260	12.5	4	0.5	108.23	1.42	1.41	0.09	477
43	2_OT_STORE_7	497	12.5	3	0.5	207.13	2.38	2.32	-0.27	799
44	2_NURSE_LOUNGE_7	497	12.5	10	0.25	207.13	3.16	2.86	-0.44	1106
45	2_OT_1	516	12.5	8	6	538.00	6.72	8.08	2.24	2536
46	2_OT_2	516	12.5	8	6	538.00	6.72	8.09	2.24	2536
47	2_OT_3	516	12.5	8	6	538.00	6.72	8.09	2.24	2536
48	2_OT_4	516	12.5	8	6	538.00	7.27	8.64	2.04	2892
49	2_OT_5	516	12.5	8	6	538.00	6.93	8.30	2.20	2672
50	2_OT_6	516	12.5	8	6	538.00	6.93	8.29	2.20	2672
51	2_OT_7	516	12.5	8	6	538.00	6.93	8.29	2.20	2672
52	2_OT_8	516	12.5	8	6	538.00	7.32	8.68	2.09	2921
53	2_DOCTOR_LOUNGE_9	490	12.5	6	0.5	204.17	2.61	2.49	-0.21	888
54	9_1	495	12.5	3	0.5	206.23	2.48	2.36	-0.32	849
55	9_2	495	12.5	3	0.5	206.23	2.48	2.36	-0.32	849
56	Cor_5	1485	12.5	10	0.5	618.70	5.31	5.77	-0.49	1512
57	OFFICES_0	2981	12.5	10	0.5	1241.88	9.95	10.88	-1.64	2788
58	2_OT_STORE_8	1001	12.5	3	1.5	416.95	5.00	4.62	-0.55	1739
59	2_TSSU_8	1001	12.5	3	1.5	416.95	4.28	4.38	-0.13	1393
60	ANESTHESIA_OFFICES	1991	12.5	15	2.5	829.42	9.61	9.21	-0.50	3209
61	1_CORRIDOR_L	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
62	Waiting_Hall	2572	12.5	50	2	1071.52	16.37	14.18	-1.50	5756
63	HELP_DESK	11029	12.5	50	1	4595.42	41.47	41.82	-7.73	12435
	THIRD FLOOR									

1	3_NICU_2	5186	12.5	60	15	2160.97	32.67	38.28	4.17	12335
2	3_Isolation_2	161	12.5	3	1	67.25	1.15	1.20	0.52	441
3	3_Doc_Duty_2	258	12.5	4	0.25	107.60	1.47	1.32	-0.04	468
4	3_Nurse_2	129	12.5	4	0	68.00	0.68	0.75	0.02	165
5	3_Store_2	129	12.5	4	0.5	68.00	0.89	0.96	0.28	263
6	3_Treatment_2	129	12.5	4	0.25	68.00	0.78	0.86	0.15	214
7	3_Room_2a	129	12.5	3	0.25	53.80	0.67	0.71	0.15	197
8	3_Room_2b	129	12.5	3	0.25	53.80	0.90	0.78	0.06	303
9	3_Maternity_Office_1	1991	12.5	25	1	829.42	10.25	9.67	-0.98	3167
10	3_Mother_Feedig	1991	12.5	25	0.5	829.42	10.04	9.46	-1.25	3069
11	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
12	3_Ward_3	3981	12.5	50	8	1658.83	23.50	22.16	1.09	7747
13	3_Office_4ato4d	560	12.5	15	1	255.00	3.95	3.55	0.27	1281
14	3_Office_4e	140	12.5	15	0.25	255.00	2.78	2.90	-0.27	730
15	3_Corridor_4a	775	12.5	10	0	322.80	3.74	3.56	-0.53	1114
16	3_Corridor_4b	1151	12.5	15	0	479.72	4.90	5.08	-0.50	1341
17	3_Change_4ato4d	516	12.5	8	0	215.20	2.42	2.43	-0.26	693
18	3_Corridor_4c	538	12.5	6	0	224.17	2.39	2.40	-0.35	682
19	3_Doctor_Rm_4ato4d	560	12.5	15	1	255.00	3.46	3.41	0.47	1051
20	3_Corridor_4d	355	12.5	6	0	147.95	1.46	1.57	-0.04	375
21	3_Doctor_Rm_4e	280	12.5	5	0.5	116.57	1.78	1.57	0.08	591
22	3_Room_4f_4g	258	12.5	5	0.5	107.60	1.90	1.55	0.02	664
23	3_Store_4c	495	12.5	3	2	206.23	4.03	3.31	0.15	1518
24	3_Store_4a_4b	258	12.5	3	2	107.60	1.82	1.90	0.97	646
25	1_CORRIDOR_J	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
26	3_OT_1	516	12.5	8	6	538.00	6.93	8.29	2.20	2672
27	3_OT_2	516	12.5	8	6	538.00	7.48	8.84	1.94	3024
28	3_STOR_5a	236	12.5	3	0.5	98.45	1.32	1.20	0.11	455
29	3_DOCTOR_RM_5a	267	12.5	4	0.5	111.37	1.24	1.29	0.21	386
30	3_CU_5a	138	12.5	2	0.25	57.30	0.86	0.73	0.01	308
31	3_TREATMENT_RM_5a	260	12.5	4	1	108.14	1.42	1.47	0.48	480
32	3_DOC_DUTY_RM_5b	234	12.5	4	0.5	97.62	1.34	1.24	0.15	458
33	3_NURSE_DUTY_RM_3a	234	12.5	4	0.25	97.62	2.24	1.88	-0.29	891
34	3_PANTYRY_5a	63	12.5	2	0.25	34.00	0.75	0.55	0.01	289
35	5_UTILITY_5a	97	12.5	2	0.25	40.45	0.67	0.57	0.07	242
36	3_WARD_5	5434	12.5	45	8	2264.08	27.65	26.15	-0.71	9405
37	3_Dean_MS_Office_8	4476	12.5	30	3	1865.07	21.43	19.34	-3.11	7166
38	3_Offices_9	2981	12.5	20	2	1241.88	13.47	12.77	-1.52	4386
39	3_Seminar_Hall_9	4476	12.5	80	3	1865.07	22.26	21.92	-0.45	7093
40	1_CORRIDOR_L	1592	12.5	25	0	663.53	7.71	7.12	-0.87	2455

41	HELP_DESK	11029	12.5	50	1	4595.42	41.47	41.82	-7.73	12435
	FOURTH FLOOR									
1	1_DEMO_ROOM	497	12.5	12	1	207.13	3.87	3.33	0.11	1428
2	1_SR_DOCTOR_1	241	12.5	3	0.25	100.43	1.26	1.20	-0.07	426
3	1_SR_DOCTOR_2	249	12.5	3	0.25	103.57	1.45	1.34	-0.10	513
4	1_RECORDS	497	12.5	6	0.5	207.13	2.91	2.69	-0.20	1025
5	1_HOD	339	12.5	4	0.5	141.23	2.64	2.20	-0.36	1013
6	1_PS_ROOM	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213
7	1_STUDENT_RM	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
8	1_JR_DR_ROOM	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
9	1_JR_DR_ROOM_2	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
10	1_Routine_lab	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
11	1_ASSIS_ROOM	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
12	1_ASSIS_ROOM_2	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
13	1_CORRIDOR_1	1229	12.5	25	0	512.09	6.00	5.57	-0.37	1864
14	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
15	1_DR_DUTY_ROO M_2	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
16	1_TREATMENT_RM _2	275	12.5	4	1	114.59	1.47	1.52	0.47	493
17	1_NURSE_ROOM_2	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
18	1_STORE_2	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
19	1_CU_2	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
20	ROOM_1	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
21	1_ROOM_2	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
22	1_WARD_1	5046	12.5	45	3	2102.68	22.47	21.87	-2.23	7161
23	1_DR_DUTY_ROO M_4	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
24	1_TREATMENT_RM _4	275	12.5	4	1	114.59	1.47	1.52	0.47	493
25	1_NURS_ROOM_4	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
26	1_STORE_4	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
27	CU_4	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
28	ROOM1	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
29	ROOM_2	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
30	WARD_2	5046	12.5	45	3	2102.68	22.47	21.87	-2.23	7161
31	1_CORRIDOR_J	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
32	10_Private_room	4831	12.5	25	5	2013.02	23.53	22.26	-2.05	7997
33	STOR_a	236	12.5	3	0.5	98.45	1.32	1.20	0.11	455
34	DOCTOR_RM_a	267	12.5	4	0.5	111.37	1.24	1.29	0.21	386
35	CU_a	138	12.5	2	0.25	57.30	0.86	0.73	0.01	308
36	TREATMENT_RM_a	260	12.5	4	1	108.14	1.42	1.47	0.48	480
37	DOC_DUTY_RM_b	234	12.5	4	0.5	97.62	1.34	1.24	0.15	458
38	NURSE_DUTY_RM_ a	234	12.5	4	0.25	97.62	2.24	1.88	-0.29	891
39	2_PANTYRY	63	12.5	2	0.25	34.00	0.75	0.55	0.01	289

40	2_UTILITY	97	12.5	2	0.25	40.45	0.67	0.57	0.07	242
41	WARD_3	5434	12.5	45	8	2264.08	27.65	26.15	-0.71	9405
42	8_Private_room	4831	12.5	25	5	2013.02	22.16	20.80	-2.24	7337
43	DR_DUTY_ROOM_7	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
44	TREATMENT_RM_7	275	12.5	4	1	114.59	1.47	1.52	0.47	493
45	NURS_ROOM_7	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
46	STORE_7a	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
47	1_CU_7	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
48	Utility_7	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
49	Store7b	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
50	WARD_4	6090	12.5	50	4	2537.57	28.43	27.01	-3.21	9313
51	Demo_Room_7	495	12.5	10	0.5	206.23	3.32	2.86	-0.23	1186
52	1_CORRIDOR_K	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
53	DR_DUTY_ROOM_9	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
54	TREATMENT_RM_9	275	12.5	4	1	114.59	1.47	1.52	0.47	493
55	NURS_ROOM_9	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
56	STORE_9	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
57	1_CU_9	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
58	ROOM_9A	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
59	ROOM_9B	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
60	WARD_5	4993	12.5	45	4	2080.27	24.44	22.95	-2.42	8140
61	DEMO_ROOM_8	497	12.5	12	1	207.13	3.51	3.01	0.10	1254
62	SR_DOCTOR_8A	241	12.5	3	0.25	100.43	1.20	1.14	-0.07	393
63	SR_DOCTOR_8B	249	12.5	3	0.25	103.57	1.26	1.18	-0.10	421
64	RECORDS_8	497	12.5	6	0.5	207.13	2.55	2.37	-0.21	851
65	HOD_8	339	12.5	4	0.5	141.23	2.08	1.79	-0.21	745
66	PS_ROOM_8	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213
67	STUDENT_RM_8	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
68	JR_DR_ROOM_8A	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
69	JR_DR_ROOM_8B	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
70	Routine_lab_8	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
71	ASSIS_ROOM_8A	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
72	ASSIS_ROOM_8B	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
73	CORRIDOR_8	1259	12.5	25	0	524.55	6.09	5.67	-0.39	1889
74	1_CORRIDOR_L	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
75	HELP_DESK	11029	12.5	50	1	4595.42	41.47	41.82	-7.73	12435
	FIFTH FLOOR									
1	5_DEMO_ROOM_1	497	12.5	12	1	207.13	3.87	3.33	0.11	1428
2	5_SR_DOCTOR_1a	241	12.5	3	0.25	100.43	1.26	1.20	-0.07	426
3	5_SR_DOCTOR_1b	249	12.5	3	0.25	103.57	1.45	1.34	-0.10	513
4	5_RECORDS_1	497	12.5	6	0.5	207.13	2.91	2.69	-0.20	1025
5	5_HOD_1	339	12.5	4	0.5	141.23	2.64	2.20	-0.36	1013
6	5_PS_ROOM_1	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213

7	5_STUDENT_RM_1	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
8	5_JR_DR_ROOM_1a	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
9	5_JR_DR_ROOM_1b	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
10	5_Routine_lab	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
11	5_ASSIS_ROOM_1a	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
12	5_ASSIS_ROOM_1b	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
13	CORRIDOR_1	1229	12.5	25	0	512.09	6.00	5.57	-0.37	1864
14	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.39	6.60	-0.83	2413
15	5_DR_DUTY_ROOM_2	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
16	5_TREATMENT_ROOM_2	275	12.5	4	1	114.59	1.47	1.52	0.47	493
17	5_NURS_ROOM_2	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
18	5_STORE_2	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
19	5_CU_2	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
20	5_ROOM_2a	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
21	5_ROOM_2b	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
22	5_WARD_1	5046	12.5	45	3	2102.68	22.47	21.87	-2.23	7161
23	5_DEMO_ROOM_3	497	12.5	12	1	207.13	3.87	3.33	0.11	1428
24	5_SR_DOCTOR_3a	241	12.5	3	0.25	100.43	1.26	1.20	-0.07	426
25	5_SR_DOCTOR_3b	249	12.5	3	0.25	103.57	1.45	1.34	-0.10	513
26	5_RECORDS_3	497	12.5	6	0.5	207.13	2.91	2.69	-0.20	1025
27	5_HOD_3	339	12.5	4	0.5	141.23	2.64	2.20	-0.36	1013
28	5_PS_ROOM_3	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213
29	5_STUDENT_RM_3	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
30	5_JR_DR_ROOM_3a	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
31	5_JR_DR_ROOM_3b	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
32	5_Routine_lab_3	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
33	5_ASSIS_ROOM_3a	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
34	5_ASSIS_ROOM_3b	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
35	5_CORRIDOR_3	1229	12.5	25	0	512.09	6.00	5.57	-0.37	1864
36	1_CORRIDOR_J	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
37	5_DR_DUTY_ROOM_4	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
38	5_TREATMENT_ROOM_4	275	12.5	4	1	114.59	1.47	1.52	0.47	493
39	5_NURS_ROOM_4	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
40	5_STORE_4	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
41	5_CU_4	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
42	5_ROOM_4a	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
43	5_ROOM_4b	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
44	5_WARD_2	5046	12.5	45	3	2102.68	22.28	21.67	-2.14	7071

45	5_STOR_a	236	12.5	3	0.5	98.45	1.32	1.20	0.11	455
46	5_DOCTOR_RM_5a	267	12.5	4	0.5	111.37	1.24	1.29	0.21	386
47	5_CU_5	138	12.5	2	0.25	57.30	0.86	0.73	0.01	308
48	5_TREATMENT_RM_5	260	12.5	4	1	108.14	1.42	1.47	0.48	480
49	5_DOC_DUTY_RM_5	234	12.5	4	0.5	97.62	1.34	1.24	0.15	458
50	5_NURSE_DUTY_RM_5	234	12.5	4	0.25	97.62	2.24	1.88	-0.29	891
51	5_PANTYRY_5	63	12.5	2	0.25	34.00	0.75	0.55	0.01	289
52	5_UTILITY_5	97	12.5	2	0.25	40.45	0.67	0.57	0.07	242
53	5_WARD_3	5434	12.5	45	5	2264.08	26.40	24.89	-2.29	8803
54	5_DR_DUTY_ROOM_7	248	12.5	4	0.5	103.45	1.63	1.36	0.05	589
55	5_TREATMENT_RM_7	275	12.5	4	1	114.59	1.47	1.52	0.47	493
56	5_NURS_ROOM_7	252	12.5	4	0.25	105.04	1.08	1.14	0.09	323
57	5_STORE_7a	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
58	5_CU_7	134	12.5	2	0.25	55.71	0.84	0.71	0.02	301
59	Utility_7	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
60	Store7b	131	12.5	3	0.25	54.45	0.88	0.75	0.06	313
61	5_WARD_4	6090	12.5	50	4	2537.57	28.43	27.01	-3.21	9313
62	Demo_Room_7	495	12.5	10	0.5	206.23	3.32	2.86	-0.23	1186
63	5_DEMO_ROOM_8	497	12.5	12	1	207.13	3.51	3.01	0.10	1254
64	5_SR_DOCTOR_8A	241	12.5	3	0.25	100.43	1.20	1.14	-0.07	393
65	5_SR_DOCTOR_8B	249	12.5	3	0.25	103.57	1.26	1.18	-0.10	421
66	RECORDS_8	497	12.5	6	0.5	207.13	2.55	2.37	-0.21	851
67	5_HOD_8	339	12.5	4	0.5	141.23	2.08	1.79	-0.21	745
68	5_PS_ROOM_8	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213
69	5_STUDENT_RM_8	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
70	JR_DR_ROOM_8A	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
71	JR_DR_ROOM_8B	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
72	Routine_lab_8	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
73	ASSIS_ROOM_8A	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
74	ASSIS_ROOM_8B	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
75	CORRIDOR_8	1259	12.5	25	0	524.55	6.09	5.67	-0.39	1889
76	1_CORRIDOR_L	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
77	5_DEMO_ROOM_6	497	12.5	12	1	207.13	3.51	3.01	0.10	1254
78	5_SR_DOCTOR_6a	241	12.5	3	0.25	100.43	1.20	1.14	-0.07	393
79	SR_DOCTOR_6B	249	12.5	3	0.25	103.57	1.26	1.18	-0.10	421
80	5_RECORDS_6	497	12.5	6	0.5	207.13	2.55	2.37	-0.21	851
81	5_HOD_6	339	12.5	4	0.5	141.23	2.08	1.79	-0.21	745
82	5_PS_ROOM_6	65	12.5	2	0.25	34.00	0.59	0.50	0.07	213
83	5_STUDENT_RM_6	116	12.5	4	0.25	68.00	0.74	0.80	0.14	212
84	5_JR_DR_ROOM_6A	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200

85	5_JR_DR_ROOM_6 B	124	12.5	3	0.25	51.78	0.64	0.66	0.15	200
86	5_Routine_lab_6	134	12.5	6	0.5	102.00	1.53	1.34	0.08	522
87	5_ASSIS_ROOM_6A	134	12.5	3	0.25	55.71	0.67	0.69	0.14	208
88	5_ASSIS_ROOM_6B	116	12.5	3	0.25	51.00	0.62	0.65	0.15	193
89	5_CORRIDOR_6	1259	12.5	25	0	524.55	6.09	5.67	-0.39	1889
90	1_CORRIDOR_K	1420	12.5	25	0	591.80	7.18	6.54	-0.74	2308
91	5_OFFICE_9Ato9E	861	12.5	18	1.5	358.67	5.28	4.78	0.38	1821
92	5_OFFICE_9F	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
93	5_OFFICE_9G	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
94	5_OFFICE_9H	172	12.5	4	0.25	71.73	1.56	1.28	-0.17	603
95	5_OFFICE_9I_9J	323	12.5	6	0.5	134.50	1.73	1.67	0.16	567
96	5_OFFICE_9k_9p	968	12.5	18	1.5	403.50	4.52	4.83	0.73	1387
97	5_OFFICE_9	495	12.5	6	0.5	206.23	3.63	3.01	-0.67	1373
98	5_HOD_OFFICE_9	495	12.5	6	0.5	206.23	3.05	2.63	-0.38	1096
99	5_Area_9	3497	12.5	25	0.5	1457.08	14.32	14.53	-2.39	4417
100	HELP_DESK	8425	12.5	50	1	3510.45	39.40	38.70	-5.74	10213
	SIXTH FLOOR									
1	6_DEMO_ROOM_1	497	12.5	12	1	207.13	3.78	3.47	0.15	1386
2	6_SR_DOCTOR_1a	241	12.5	3	0.25	100.43	1.22	1.26	-0.05	405
3	6_SR_DOCTOR_1b	249	12.5	3	0.25	103.57	1.41	1.41	-0.08	491
4	6_RECORDS_1	497	12.5	6	0.5	207.13	2.82	2.83	-0.16	983
5	6_HOD_1	339	12.5	4	0.5	141.23	2.58	2.29	-0.33	984
6	6_PS_ROOM_1	65	12.5	2	0.25	34.00	0.58	0.52	0.08	208
7	6_STUDENT_RM_1	116	12.5	4	0.25	68.00	0.72	0.83	0.15	202
8	6_JR_DR_ROOM_1 a	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
9	6_JR_DR_ROOM_1 b	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
10	6_Routine_lab_1	134	12.5	6	0.5	102.00	1.51	1.38	0.09	511
11	6_ASSIS_ROOM_1a	134	12.5	3	0.25	55.71	0.64	0.73	0.15	196
12	6_ASSIS_ROOM_1b	116	12.5	3	0.25	51.00	0.60	0.68	0.16	183
13	6_CORRIDOR_1	1229	12.5	25	0	512.09	5.78	5.92	-0.27	1759
14	1_CORRIDOR_I	1420	12.5	25	0	591.80	7.14	7.00	-0.72	2293
15	6_DR_DUTY_ROOM_2	248	12.5	4	0.5	103.45	1.59	1.43	0.06	568
16	6_TREATMENT_RM_2	275	12.5	4	1	114.59	1.42	1.60	0.49	470
17	6_NURSE_ROOM_2	252	12.5	4	0.25	105.04	1.04	1.21	0.11	302
18	6_STORE_2	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
19	6_CU_2	134	12.5	2	0.25	55.71	0.82	0.75	0.03	290
20	6_ROOM_2a	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
21	6_ROOM_2b	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
22	6_WARD_1	5046	12.5	45	3	2102.68	21.58	23.29	-1.85	6733
23	6_DEMO_ROOM_3	497	12.5	12	1	207.13	3.78	3.47	0.15	1386
24	6_SR_DOCTOR_3a	241	12.5	3	0.25	100.43	1.22	1.26	-0.05	405

25	6_SR_DOCTOR_3b	249	12.5	3	0.25	103.57	1.41	1.41	-0.08	491
26	6_RECORDS_3	497	12.5	6	0.5	207.13	2.82	2.83	-0.16	983
27	6_HOD_3	339	12.5	4	0.5	141.23	2.58	2.29	-0.33	984
28	6_PS_ROOM_3	65	12.5	2	0.25	34.00	0.58	0.52	0.08	208
29	6_STUDENT_RM_3	116	12.5	4	0.25	68.00	0.72	0.83	0.15	202
30	6_JR_DR_ROOM_3 a	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
31	6_JR_DR_ROOM_3 b	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
32	6_Routine_lab_3	134	12.5	6	0.5	102.00	1.51	1.38	0.09	511
33	6_ASSIS_ROOM_3a	134	12.5	3	0.25	55.71	0.64	0.73	0.15	196
34	6_ASSIS_ROOM_3b	116	12.5	3	0.25	51.00	0.60	0.68	0.16	183
35	6_CORRIDOR_3	1229	12.5	25	0	512.09	5.78	5.92	-0.27	1759
36	1_CORRIDOR_J	1420	12.5	25	0	591.80	6.93	6.94	-0.64	2188
37	6_DR_DUTY_ROOM_4	248	12.5	4	0.5	103.45	1.59	1.43	0.06	568
38	6_TREATMENT_RM_4	275	12.5	4	1	114.59	1.42	1.60	0.49	470
39	6_NURSE_ROOM_4	252	12.5	4	0.25	105.04	1.04	1.21	0.11	302
40	6_STORE_4	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
41	6_CU_4	134	12.5	2	0.25	55.71	0.82	0.75	0.03	290
42	6_ROOM_4a	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
43	6_ROOM_4b	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
44	6_WARD_2	5046	12.5	45	3	2102.68	21.39	23.08	-1.77	6643
45	6_STOR_a	236	12.5	3	0.5	98.45	1.28	1.27	0.12	435
46	6_DOCTOR_RM_5a	267	12.5	4	0.5	111.37	1.19	1.36	0.23	364
47	6_CU_5	138	12.5	2	0.25	57.30	0.84	0.76	0.02	296
48	6_TREATMENT_RM_5	260	12.5	4	1	108.14	1.38	1.55	0.50	458
49	6_DOC_DUTY_RM_5	234	12.5	4	0.5	97.62	1.30	1.31	0.17	439
50	6_NURSE_DUTY_RM_5	234	12.5	4	0.25	97.62	2.20	1.94	-0.28	871
51	6_PANTYRY_5	63	12.5	2	0.25	34.00	0.74	0.57	0.02	284
52	6_UTILITY_5	97	12.5	2	0.25	40.45	0.65	0.60	0.07	234
53	6_WARD_3	5434	12.5	45	5	2264.08	25.44	26.41	-1.88	8343
54	6_DR_DUTY_ROOM_7	248	12.5	4	0.5	103.45	1.59	1.43	0.06	568
55	6_TREATMENT_RM_7	275	12.5	4	1	114.59	1.42	1.60	0.49	470
56	6_NURSE_ROOM_7	252	12.5	4	0.25	105.04	1.04	1.21	0.11	302
57	6_STORE_7a	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
58	6_CU_7	134	12.5	2	0.25	55.71	0.82	0.75	0.03	290
59	6_Utility_7	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
60	6_Store7b	131	12.5	3	0.25	54.45	0.86	0.79	0.07	302
61	6_WARD_4	6090	12.5	50	4	2537.57	27.36	28.72	-2.76	8797
62	6_Demo_Room_7	495	12.5	10	0.5	206.23	3.23	3.00	-0.19	1144

63	6_DEMO_ROOM_8	497	12.5	12	1	207.13	3.42	3.15	0.14	1212
64	6_SR_DOCTOR_8A	241	12.5	3	0.25	100.43	1.15	1.21	-0.05	372
65	6_SR_DOCTOR_8B	249	12.5	3	0.25	103.57	1.22	1.25	-0.08	400
66	6_RECORDS_8	497	12.5	6	0.5	207.13	2.46	2.51	-0.17	809
67	6_HOD_8	339	12.5	4	0.5	141.23	2.02	1.88	-0.19	717
68	6_PS_ROOM_8	65	12.5	2	0.25	34.00	0.58	0.52	0.08	208
69	6_STUDENT_RM_8	116	12.5	4	0.25	68.00	0.72	0.83	0.15	202
70	6_JR_DR_ROOM_8A	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
71	6_JR_DR_ROOM_8B	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
72	6_Routine_lab_8	134	12.5	6	0.5	102.00	1.51	1.38	0.09	511
73	ASSIS_ROOM_8A	134	12.5	3	0.25	55.71	0.64	0.73	0.15	196
74	6_ASSIS_ROOM_8B	116	12.5	3	0.25	51.00	0.60	0.68	0.16	183
75	6_CORRIDOR_8	1259	12.5	25	0	524.55	5.87	6.03	-0.29	1782
76	1_CORRIDOR_L	1420	12.5	25	0	591.80	6.93	6.94	-0.64	2188
77	6_DEMO_ROOM_6	497	12.5	12	1	207.13	3.42	3.15	0.14	1212
78	6_SR_DOCTOR_6a	241	12.5	3	0.25	100.43	1.15	1.21	-0.05	372
79	6_SR_DOCTOR_6B	249	12.5	3	0.25	103.57	1.22	1.25	-0.08	400
80	6_RECORDS_6	497	12.5	6	0.5	207.13	2.46	2.51	-0.17	809
81	6_HOD_6	339	12.5	4	0.5	141.23	2.02	1.88	-0.19	717
82	6_PS_ROOM_6	65	12.5	2	0.25	34.00	0.58	0.52	0.08	208
83	6_STUDENT_RM_6	116	12.5	4	0.25	68.00	0.72	0.83	0.15	202
84	6_JR_DR_ROOM_6A	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
85	6_JR_DR_ROOM_6B	124	12.5	3	0.25	51.78	0.62	0.70	0.16	189
86	Routine_lab_6	134	12.5	6	0.5	102.00	1.51	1.38	0.09	511
87	6_ASSIS_ROOM_6A	134	12.5	3	0.25	55.71	0.64	0.73	0.15	196
88	6_ASSIS_ROOM_6B	116	12.5	3	0.25	51.00	0.60	0.68	0.16	183
89	6_CORRIDOR_6	1259	12.5	25	0	524.55	5.87	6.03	-0.29	1782
90	1_CORRIDOR_K	1420	12.5	25	0	591.80	6.93	6.94	-0.64	2188
91	6_OFFICE_9Ato9E	861	12.5	18	1.5	358.67	5.13	5.02	0.45	1748
92	6_OFFICE_9F	172	12.5	4	0.25	71.73	1.53	1.33	-0.16	588
93	6_OFFICE_9G	172	12.5	4	0.25	71.73	1.53	1.33	-0.16	588
94	6_OFFICE_9H	172	12.5	4	0.25	71.73	1.53	1.33	-0.16	588
95	6_OFFICE_9I_9J	323	12.5	6	0.5	134.50	1.67	1.76	0.18	540
96	6_OFFICE_9k_9p	968	12.5	18	1.5	403.50	4.35	5.10	0.80	1305
97	6_OFFICE_9	495	12.5	6	0.5	206.23	3.54	3.15	-0.64	1331
98	6_HOD_OFFICE_9	495	12.5	6	0.5	206.23	2.97	2.77	-0.34	1054
99	6_Area_9	3497	12.5	25	0.5	1457.08	13.70	15.51	-2.13	4121
100	HELP_DESK	8425	12.5	50	1	3510.45	38.70	39.90	-5.12	9498
	Library & Admin Block									
	GROUND FLOOR									
1	Director_Finance	377	12.5	6	0.5	156.92	2.76	2.32	-0.13	1031

2	Classified_Finance_2	129	12.5	3	0.25	53.80	0.86	0.79	0.11	302
3	Classified_Finance_1	129	12.5	3	0.5	53.80	1.27	0.98	0.13	498
4	Faculties_Director_1	129	12.5	3	0.25	53.80	1.16	0.88	0.00	448
5	Classified_Faculties_1	129	12.5	3	0.25	53.80	1.16	0.88	0.00	448
6	Area_1A	2475	12.5	30	0.25	1031.17	13.46	11.94	-0.69	4608
7	Director_Admission	215	12.5	6	0.5	102.00	2.06	1.76	0.01	777
8	Director_Student_Affairs	161	12.5	10	0.5	170.00	1.86	2.01	0.19	540
9	Director_It	247	12.5	5	0.5	103.12	1.54	1.49	0.28	534
10	Classified_It	129	12.5	5	0.5	85.00	1.24	1.23	0.22	417
11	Classified_Student_Affairs	129	12.5	10	0.25	170.00	1.69	1.86	0.03	459
12	Director_Security_It	129	12.5	4	0.25	68.00	1.02	0.98	0.09	348
13	OPs_Control_Room	129	12.5	4	0.25	68.00	1.02	0.98	0.09	348
14	Huddle_Room	129	12.5	4	0.25	68.00	0.97	0.91	0.15	326
15	Area_1B	3508	12.5	30	0.25	1461.57	16.81	15.63	-0.80	5562
16	Area_2	1528	12.5	30	0.25	636.63	8.68	7.78	0.23	2915
17	Common	1087	12.5	48	0.25	816.00	10.77	10.55	-0.45	3475
18	Cafe	2959	12.5	100	0.25	1700.00	20.81	20.77	0.57	6454
	FIRST FLOOR									
1	Computer_teaching_Room	689	12.5	30	0.5	510.00	6.69	6.34	-0.26	2150
2	Classified_Staff_1	161	12.5	3	0.25	67.25	1.04	0.97	0.09	367
3	Classified_Staff_2	161	12.5	3	0.25	67.25	1.04	0.97	0.09	367
4	Director_1	161	12.5	3	0.25	67.25	1.04	0.97	0.09	367
5	Director_2	247	12.5	3	0.25	103.12	1.93	1.49	-0.19	741
6	Conference_1	538	12.5	20	0.25	340.00	5.15	4.41	-0.34	1768
7	Area_1B	2604	12.5	50	2	1084.97	15.20	13.80	1.15	5175
8	Small_Group_Study_1	140	12.5	6	0.25	102.00	1.65	1.38	-0.08	581
9	Small_Group_Study_2	140	12.5	3	0.25	58.28	1.02	0.85	0.10	372
10	Conference_Medium_2	247	12.5	20	0.5	340.00	3.82	3.77	-0.11	1128
11	Area_1A	3045	12.5	50	2	1268.78	18.04	16.21	0.23	6257
12	Office_1	140	12.5	3	0.25	58.28	1.34	0.98	-0.07	527
13	Office_2	140	12.5	3	0.25	58.28	1.02	0.85	0.10	372
14	Area_2	5746	12.5	70	2	2394.10	33.80	30.80	-1.31	11925
	SECOND FLOOR									
1	Director_CC_Lab	215	12.5	12	1	204.00	3.38	3.07	0.03	1197
2	Classified_Staff_1	161	12.5	3	0.25	67.25	1.01	1.01	0.10	353

3	Classified_Staff_2	161	12.5	3	0.25	67.25	1.01	1.01	0.10	353
4	Director_1	161	12.5	3	0.25	67.25	1.01	1.01	0.10	353
5	Classified_4	161	12.5	3	0.25	67.25	1.60	1.22	-0.15	637
6	Classified_3	161	12.5	3	0.25	67.25	1.01	1.01	0.10	353
7	Director_2	161	12.5	3	0.25	67.25	1.01	1.01	0.10	353
8	Conf_1	161	12.5	10	0.25	170.00	1.73	1.95	0.07	479
9	Classified_2	161	12.5	10	0.25	170.00	1.73	1.95	0.07	479
10	Dean	301	12.5	4	0.5	125.53	2.59	2.38	-0.08	1015
11	Assistant_Dean	161	12.5	4	0.5	68.00	1.48	1.44	0.22	569
12	Vice_Dean_1	237	12.5	4	0.5	98.63	1.89	1.88	0.20	720
13	Vice_Dean_2	237	12.5	4	0.5	98.63	1.60	1.52	0.04	581
14	Board_Room	387	12.5	15	0.5	255.00	3.84	3.59	-0.09	1316
15	Conference_0	291	12.5	15	0.5	255.00	3.10	3.09	0.13	959
16	Room_X	129	12.5	4	0.25	68.00	0.79	0.90	0.22	236
17	Room_Y	129	12.5	4	0.25	68.00	0.79	0.90	0.22	236
18	Corridor	2486	12.5	35	0.25	1035.65	14.19	13.44	-1.00	4906
	MEDICAL COLLEGE									
	GROUND FLOOR									
1	CONF_1	204	12.5	8	0.25	136.00	1.41	1.59	0.24	393
2	CONF_2	204	12.5	8	0.25	136.00	1.41	1.59	0.24	393
3	CONF_3	204	12.5	8	0.25	136.00	1.41	1.59	0.24	393
4	CONF_4	204	12.5	8	0.25	136.00	1.41	1.59	0.24	393
5	COR_0	979	12.5	20	0	407.98	5.12	4.95	0.25	1649
6	ANATOMY_1	807	12.5	35	0.5	595.00	7.47	7.24	-0.10	2348
7	ANATOMY_2	807	12.5	35	0.5	595.00	8.04	7.55	-0.47	2623
8	ROOM_A	129	12.5	3	0.25	53.80	0.71	0.75	0.21	230
9	ROOM_B	129	12.5	3	0.25	53.80	0.96	0.85	0.10	351
10	COR_X1	1001	12.5	10	0	416.95	7.80	5.94	-1.64	3018
	FIRST FLOOR									
1	SEMINAR_1	172	12.5	12	0.5	204.00	2.73	2.59	-0.07	886
2	TUTOR_1	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
3	TUTOR_2	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
4	TUTOR_3	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
5	ASSOCIATE_PROF_1	97	12.5	4	0.25	68.00	0.99	0.96	0.06	334
6	ASSOCIATE_PROF_2	97	12.5	4	0.25	68.00	0.99	0.96	0.06	334
7	ASSOCIATE_PROF_3	97	12.5	4	0.25	68.00	1.50	1.35	-0.13	581
8	HOD1	194	12.5	6	0.5	102.00	1.92	1.61	0.10	711
9	COR_A	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
10	COR_B	732	12.5	20	0	340.00	4.52	4.25	0.16	1463
11	COR_C	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
12	HOD_2	194	12.5	6	0.5	102.00	1.94	1.61	0.10	719
13	ASSO_PROF_8	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392

14	ASSO_PROF_7	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392
15	ASSO_PROF_6	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392
16	ASSO_PROF_5	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392
17	ASSO_PROF_4	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392
18	TUTOR_4	97	12.5	4	0.5	68.00	1.11	1.05	0.19	392
19	SEMINAR_2	172	12.5	12	0.5	204.00	2.76	2.58	-0.08	901
	SECOND FLOOR									
1	SEMINAR_1	172	12.5	12	0.5	204.00	2.74	2.60	-0.08	892
2	MEETING_1	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
3	MEETING_2	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
4	MEETING_3	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
5	TUTORS_1	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
6	ASSOCIATE_PROF_1	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
7	ASSOCIATE_PROF_2	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
8	HOD1	194	12.5	6	0.5	102.00	1.92	1.61	0.10	712
9	COR_A	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
10	COR_B	732	12.5	20	0	340.00	4.52	4.25	0.16	1463
11	COR_C	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
12	HOD_2	194	12.5	6	0.5	102.00	1.94	1.61	0.10	719
13	ASSO_PROF_3	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
14	ASSO_PROF_4	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
15	ASSO_PROF_5	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
16	TUTOR_2	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
17	MEETING_4	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
18	MEETING_5	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
19	SEMINAR_2	172	12.5	15	0.5	255.00	3.10	3.04	-0.11	959
	THIRD FLOOR									
1	SEMINAR_1	172	12.5	12	0.5	204.00	2.74	2.60	-0.08	892
2	MEETING_1	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
3	MEETING_2	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
4	MEETING_3	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
5	TUTORS_1	97	12.5	5	0.25	85.00	1.11	1.11	0.05	354
6	ASSOCIATE_PROF_1	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
7	ASSOCIATE_PROF_2	97	12.5	4	0.25	68.00	0.99	0.96	0.06	336
8	HOD1	194	12.5	6	0.5	102.00	1.92	1.61	0.10	712
9	COR_A	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
10	COR_B	732	12.5	20	0	340.00	4.52	4.25	0.16	1463
11	COR_C	850	12.5	20	0	354.18	4.67	4.45	0.29	1513
12	HOD_2	194	12.5	6	0.5	102.00	1.94	1.61	0.10	719
13	ASSO_PROF_3	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
14	ASSO_PROF_4	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342

15	ASSO_PROF_5	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
16	Asso_Prof_6	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
17	Asso_Prof_7	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
18	TUTOR_2	97	12.5	4	0.25	68.00	1.01	0.95	0.06	342
19	SEMINAR_2	172	12.5	15	0.5	255.00	3.10	3.04	-0.11	959
	FOURTH FLOOR									
1	SEMINAR	172	12.5	12	0.5	204.00	2.80	2.68	-0.10	920
2	MEETING_1	97	12.5	4	0.25	68.00	0.99	1.00	0.06	336
3	MEETING_2	172	12.5	12	0.5	204.00	2.36	2.55	0.08	708
4	TUTOR_1	97	12.5	4	0.25	68.00	0.99	1.00	0.06	336
5	ASSO_PROF_1	97	12.5	4	0.25	68.00	0.99	1.00	0.06	336
6	ASSO_PROF_2	97	12.5	4	0.25	68.00	0.99	1.00	0.06	336
7	HOD1	194	12.5	6	0.5	102.00	1.92	1.69	0.10	711
8	COR_A	850	12.5	20	0	354.18	4.63	4.77	0.31	1493
9	COR_B	732	12.5	20	0	340.00	4.48	4.52	0.18	1445
10	COR_C	409	12.5	20	0	340.00	3.72	3.94	-0.08	1079
11	HOD_2	194	12.5	6	0.5	102.00	1.93	1.68	0.10	714
12	ASSO_PROF_3	97	12.5	4	0.25	68.00	1.00	0.99	0.06	339
13	ASSO_PROF_4	97	12.5	4	0.25	68.00	1.00	0.99	0.06	339
14	TUTORS_2	97	12.5	3	0.25	51.00	0.89	0.83	0.07	321
15	SEMINAR_2	97	12.5	6	0.25	102.00	1.23	1.29	0.04	376
16	DEMONSTRATION	807	12.5	45	0.5	765.00	8.63	9.24	-0.06	2470
	MEDICAL LAB									
	GROUND FLOOR									
1	Preparation_Room	398	12.5	5	0.25	165.88	2.71	2.25	-0.13	1000
2	Stora	377	12.5	5	0.5	156.92	2.67	2.12	0.01	997
3	Histology_Lab_1	2044	12.5	50	2	851.83	11.98	11.77	1.94	3983
4	Body_Cold_Storage	398	12.5	3	1.5	165.88	2.77	2.56	0.60	1048
5	Embalming	377	12.5	5	0.5	156.92	2.67	2.12	0.01	997
6	Histology_Lab_2	2819	12.5	75	2	1275.00	16.52	16.53	2.33	5283
7	Change_Locker_2	226	12.5	10	0	170.00	2.16	2.08	-0.10	685
8	Change_Locker_1	247	12.5	10	0	170.00	2.50	2.06	-0.22	849
9	VIVARIUM	2453	12.5	15	1	4088.80	22.31	28.30	-8.68	4332
10	ROOM_1	226	12.5	3	0.25	94.15	1.05	1.09	0.19	332
11	ROOM_2_3_4_5	495	12.5	12	0.5	206.23	2.82	2.73	0.49	927
12	ROOM_6	194	12.5	4	0.25	80.70	0.98	1.02	0.24	312
13	ROOM_7_8_9_10	603	12.5	16	1	272.00	3.96	3.73	0.71	1335
14	ROOM_11	387	12.5	4	0.25	161.40	1.67	1.74	0.19	516
15	COR_X	441	12.5	8	0	183.82	2.29	2.14	0.06	745
16	COR_7	506	12.5	6	0	210.72	2.42	2.28	-0.03	784
17	LECTURE_THEATRE	5036	12.5	200	1	3400.00	35.40	37.32	2.20	9923
	FIRST FLOOR									
1	DEMONSTRATION_1	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
2	DEMONSTRATION_	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774

	2									
3	Mammalian_LAB_1	1033	12.5	25	1	430.40	5.94	5.69	0.97	1959
4	Equipment_1	516	12.5	2	2	215.20	2.75	2.85	1.01	975
5	Dept_Library	818	12.5	30	0.25	510.00	5.74	5.80	0.34	1695
6	Research_LAB_1	818	12.5	15	2	340.73	5.10	4.81	1.17	1789
7	Research_LAB_2	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
8	Research_LAB_3	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
9	AMPHIBIAN_LAB	2443	12.5	50	1	1017.72	12.80	12.36	1.33	4121
10	HUMAN_LAB	2443	12.5	50	1	1017.72	12.86	12.38	1.30	4154
11	LECTURE_THEATRE	5036	25	250	2	4250.00	40.19	44.76	2.70	10451
12	COR_7	506	12.5	6	0	210.72	2.42	2.28	-0.03	784
	SECOND FLOOR									
1	DEMONSTRATION_1	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
2	DEMONSTRATION_2	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
3	Forensic_Med_Lab_1	764	12.5	6	1	318.32	4.05	3.74	0.32	1402
4	Museum	807	12.5	10	0.5	336.25	3.55	3.71	0.45	1095
5	Forensic_Med_Lab_2	764	12.5	6	1	318.32	4.37	3.84	0.19	1556
6	Research_LAB_1	818	12.5	15	2	340.73	5.10	4.81	1.17	1789
7	Research_LAB_2	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
8	Practical_Lab	807	12.5	30	2	510.00	6.45	6.52	1.25	2036
9	Morbid_Anatomy_Lab	2443	12.5	30	1	1017.72	12.21	11.49	0.41	4030
10	Clinical_Pathology_Lab	2443	12.5	50	1.5	1017.72	13.42	12.69	1.43	4419
	THIRD FLOOR									
1	DEMONSTRATION_1	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
2	DEMONSTRATION_2	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
3	DEMONSTRATION_3	807	12.5	25	0.5	425.00	5.26	5.15	0.51	1642
4	Museum	861	12.5	10	0.5	358.67	3.73	3.91	0.44	1152
5	DEMONSTRATION_4	807	12.5	25	0.5	425.00	5.32	5.17	0.49	1671
6	Research_LAB_1	818	12.5	15	2	340.73	5.10	4.81	1.17	1789
7	Research_LAB_2	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
8	Lab	861	12.5	30	2	510.00	6.56	6.59	1.30	2087
9	Experimental_Pharmacology	2443	12.5	30	3	1017.72	13.05	12.32	1.46	4432
10	Pharmacology_Pharmacy	2443	12.5	20	1	1017.72	10.96	10.77	0.33	3524
11	LECTURE_THEATRE	5036	25	250	2	4250.00	40.19	44.76	2.70	10451
12	COR_7	506	12.5	6	0	210.72	2.42	2.28	-0.03	784

	FOURTH FLOOR									
1	DEMONSTRATION_1	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
2	DEMONSTRATION_2	915	12.5	25	0.5	425.00	5.53	5.31	0.59	1774
3	DEMONSTRATION_3	807	12.5	25	0.5	425.00	5.26	5.15	0.51	1642
4	Museum_1	861	12.5	10	0.5	358.67	3.73	3.91	0.44	1152
5	DEMONSTRATION_4	807	12.5	25	0.5	425.00	5.32	5.17	0.49	1671
6	Museum_2	861	12.5	10	0.25	358.67	3.63	3.80	0.31	1102
7	Dep_Library	818	12.5	30	0.25	510.00	5.10	5.61	0.59	1386
8	Research_LAB	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
9	Microbiology_Bunsen_Burner	2443	12.5	20	3	1017.72	12.55	11.83	1.08	4287
10	Microbiology_Tables	2443	12.5	20	1	1017.72	11.71	10.99	0.03	3886
	FIFTH FLOOR									
1	Shared_Lab_1	915	12.5	15	1.5	255.00	4.77	4.23	1.24	1760
2	shared_lab_2	861	12.5	15	1.5	255.00	4.98	4.26	1.07	1863
3	Shared_Lab_3	915	12.5	15	1.5	255.00	4.77	4.23	1.24	1760
4	shared_lab_4	861	12.5	15	1.5	255.00	4.98	4.26	1.07	1863
5	Research_LAB_1	818	12.5	15	2	340.73	5.10	4.81	1.17	1789
6	Research_LAB_2	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
7	Research_LAB_3	818	12.5	15	2	340.73	5.10	4.81	1.17	1789
8	Research_LAB_4	818	12.5	15	2	340.73	4.46	4.62	1.43	1480
9	Departmental_Research_Lab	4186	12.5	60	3	1744.02	20.67	20.30	2.18	6702
10	LECTURE_THEATRE	5036	25	250	2	4250.00	40.19	44.76	2.70	10451
11	COR_7	506	12.5	6	0	210.72	2.42	2.28	-0.03	784
	SIXTH FLOOR									
1	SHARED_LAB_1	1775	12.5	30	1.5	739.75	9.80	9.93	1.05	3239
2	SHARED_LAB_2	1775	12.5	30	1.5	739.75	9.11	9.73	1.32	2910
3	SHARED_LAB_3	1775	12.5	30	1.5	739.75	9.11	9.73	1.32	2910
4	SHARED_LAB_6	1775	12.5	30	1.5	739.75	9.80	9.93	1.05	3239
5	SHARED_LAB_4	1205	12.5	15	1.5	502.13	5.63	6.38	1.12	1768
6	SHARED_LAB_5	1205	12.5	15	1.5	502.13	6.86	6.74	0.64	2360
7	MICRO_BIO_1	215	12.5	2	0.25	89.67	1.16	1.14	0.08	399
8	MICRO_BIO_2_3_4_5	473	12.5	12	1	204.00	2.96	3.07	0.75	995
9	MICRO_BIO_6	366	12.5	4	0.25	152.43	2.02	1.93	0.03	701
10	MICRO_BIO_7_8_9_10	753	12.5	16	1	313.83	4.85	4.59	0.57	1701
11	COR_X	377	12.5	8	0	156.92	2.05	2.04	0.09	668
	TOTAL FOR CHANDRAPUR	623939	12.5	9819	633	287851	3467	3428.44	-11.63	1125491

On the basis of data given above, the estimated load for the air conditioning system is Summarised

(Tenderers shall work out the heat loads on their own and satisfy themselves that the plant specified in this tender shall be able to maintain the inside conditions as per specification)

To cater to the above load, the air conditioning system proposed is as follows:

6.0 System Design

The total peak load comes out to 3467TR. After applying a diversity of .85 (Since external and internal loads don't peak at the same time), the load works out to be 2947TR. For this requirement 3 Nos. working and 01 standby Water cooled centrifugal chillers of 1000 TR are proposed.

System Design Description

- 6.1 It is proposed to provide a central air conditioning system to maintain the specified inside design conditions during summer, monsoon and winter for the proposed building.
- 6.2 Water chilling machines shall work in conjunction with primary chilled water pumps, secondary chilled water pumps along with Tertiary Chilled Water pumps. The AC plants shall be located in the Main Hospital Building.
- 6.3 Chilled water produced shall be pumped to various air handling units/ Fan coil units. Chilled water shall be pumped through insulated chilled water pipes installed in ceiling spaces and in vertical risers in pipe shafts. At each air handling units balancing valves are provided for balancing.
- 6.4 Electric type hot water generators shall be used for winter heating. This is after taking partial credit for the high equipment load inside and the diversity applicable.
- 6.5 The main electrical panel, distribution board & chilled water/ condenser water pumps will be located in the respective plant rooms.
- 6.6 All the AHU's / FCUs on respective floors shall be connected with chilled water pipes coming from the water chilling machines.
- 6.7 For fire safety motorised fire dampers with electrical actuators interlocked with the air blowers shall be provided in supply and return air paths. All materials used for insulation shall be fire proof type. The air handling unit's motors shall also be interlocked with the central fire alarm system such that in case of detection of smoke or fire by the fire alarm system, the air handling units shall automatically shut off.
- 6.8 A Chiller plant manager shall be provided in AC plant room. CPM shall be connected to Building Management System.

6.9 Two level filtration shall be adopted with pre-filters and fine filters of following filtration efficiency:

Fine Filters 99% down to 3 μ

Pre Filters 90% down to 10 μ

All these filters shall be with aluminum frame to prevent formation of bacterial colonies. Epoxy resin shall be used to seal filter media with the framework.

7. GENERAL DESIGN GUIDELINES

Design parameters for selection of air handling units and its components shall be: -

Maximum face velocity across prefilters	150M/MIN
Maximum face velocity across Microvee	100M/MIN
Maximum face velocity across cooling coil	150 M/MIN
Maximum face velocity across Heating coil	200 M/MIN
Maximum fan outlet velocity	550 M/MIN
Maximum fan motor speed	1450 RPM

CHW piping shall be sized for following design parameters

Maximum flow velocity	2.5 M/SEC
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Design parameters for duct design shall be

Maximum flow velocity	450M/MIN
Maximum friction	1CM WG/100M
Maximum velocity at supply air outlet	150 M/MIN

8.0 Items to be provided by other Agencies to AC contractor:

- 8.1 Construction of AC plant rooms, AHU rooms etc.
- 8.2 Main 3 ph, 415 v, 50 hz, A.C. supply power supply up to main Electrical Distribution Panel in A/C plant room.
- 8.3 Soft filtered water supply up to each cooling tower and expansion tank etc.
- 8.4 Make up water tanks for soft water.
- 8.5 Drain trap in plant room and AHU rooms.

- 8.6 Any kind of false ceiling, boxing etc and insulation of boxing in non AC areas.
- 8.7 Making frames for fixing grilles & diffusers in false ceiling, boxing or in walls.

9.0 Drawings:

The drawings forming part of these specifications provide a feasible scheme for locating the equipment. The contractor may re-arrange the equipment for improving the layout and meeting the site conditions. All such changes shall however be subject to the architect's approval. These drawings are not meant to be working drawings which shall be prepared by the contractor.

Drawings for approval on award of the work:-

The contractor shall prepare & submit three sets of hard copy & one Digital/soft copy in AutoCAD format of following drawings and get them approved from the engineer-in-Charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipments/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

- i) Lay out drawings of the equipments to be installed in various rooms such as plant room, AHU rooms, hot water generator room, cooling tower and other equipments.
- ii) Drawings including section, showing the details of erection of entire equipments including their foundations, water basin for the cooling towers / air washers, etc.
- iii) Plumbing drawings showing the layout of entire piping, dia & length of pipes, valves and isometric drawings showing connections to various equipment.
- iv) Ducting drawings showing sizes, locations of dampers, grilles & diffusers.
- v) Electrical wiring diagrams for all electrical equipments and controls including the sizes and capacities of the various cables and equipments.
- vi) Dimensioned drawings of all electrical and control panels.
- vii) Drawings showing the details of all insulations and vapour barrier works.
- viii) Drawings showing details of supports for pipes, cable trays, ducts etc.
- ix) Any other drawings relevant to the work.

The department shall, at its discretion, use the soft copy of such drawings to prepare and examine the integrated services layout, resolve conflicts, and advise the contractor to modify the execution drawings suiting & adjusting to all the services requirements. The contractor shall be bound to modify & execute accordingly.

10.0 Completion drawings (As Built Drawings)

One set of Digital/ soft Copy and one set of the following laminated drawings shall be submitted by the contractor while handing over the installation to the client. Out of this one of the sets shall be laminated on a hard base for display in the A.C. plant room. In addition one set will be given on compact disc.

(i) Plant installation drawings giving complete details of all the equipments, including their foundations.

(ii) AHU room installation drawings.

(iii) Plumbing layout drawings including insulation giving sizes and lengths of all the pipes and the sizes and locations of all types of valves, and including isometric drawings for the entire piping including the pipe connections to the various equipments and insulation details wherever required.

(iv) Duct layout drawings with their sizes and locations, and sizes and locations of all dampers, grills & diffusers.

(v) Line diagram and layout of all electrical control panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

(vi) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.

(vii) BMS drawings (wherever applicable)

11.0 Test Data:

The complete HVAC system shall be tested as per the specifications given elsewhere and complete test data shall be furnished on prescribed data sheets:

12.0 Documents to be furnished on completion of installation

Three sets of the following documents shall be furnished to the department by the contractor on completion of work:-

a) Completion drawings as per 10.0.

b) One set in Digital form and 1 set in printed form of manufacturer's technical catalogues of all equipments and accessories,

c) Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

13.0 Technical Data:

The contractor shall furnish complete technical data, on the equipment offered as required under the heading 'Technical data'. In this specification every effort has been taken to put forth only general specifications of various equipments/ material.

If inadvertently, any of the specification drawn happens to match with the specifications of any one particular firm's product only, in respect of critical parameters, than it will not automatically mean that this particular firm's offer is only technically suitable. In general, the specifications offered by other firms will be assessed in their own entirety to ascertain whether or not the broad functions in general expected of the requirements are available with reasonable tolerance on the desired requirements of the client and accordingly the offers would be considered based on prudent assessment and sole discretion of the Engineer.

14.0 Performance Guarantee:

- 14.1 The contractor shall guarantee that the air-conditioning plant and system shall maintain the desired inside temperature within +/- 2 % tolerance.
- 14.2 The contractor shall guarantee that the capacity of various components as well as the whole system shall not be less than specified.
- 14.3 The contractor shall ensure that the system shall be free of vibrations and disturbing sounds.

15.0 Foreign Exchange

The contractor shall make his own arrangements to procure the necessary, specified equipments, controls for which no foreign exchange shall be made available.

CENTRAL AIR CONDITIONING PLANT

1.0 SCOPE

This chapter describes central Air-conditioning plant with factory assembled & tested chilling units (ARI certified) comprising of Centrifugal / Screw compressor, as the case may be, direct driven with electric motor, water cooled condenser, chiller, micro computer control centre and all interconnecting unit piping and wiring and tested and complete in all respects and shall generally comply with specifications as given in subsequent paragraphs. Control panel box with controls, starter for motor as specified and MODBUS/ BACNET connectivity.

Performance will be certified in accordance with ARI Standard 550/590 (latest) and ECBC 2007. Only chillers that are listed in the ARI Certification Program are acceptable.

AHRI certified selection sheets should mention VFD with active harmonic filter and sound level at 100%, 75%, 50% and 25% load as per AHRI standard and sound level at part load should not exceed full load.

1.1 CENTRIFUGAL COMPRESSORS

1.1.1 Type

Centrifugal compressor shall be open/ semi-sealed/ totally sealed type. It shall be working on refrigerant 134a. The impeller shall be of shrouded design and made of cast aluminium alloy of high strength and protected against corrosion. This shall be statically and dynamically balanced and over speed tested so as to ensure vibration free operation. The impeller shaft or drive end of the gear shaft, as the case may be, shall be connected with the motor through a flexible coupling in case of open design and rotor shaft in case of hermetic design. The compressor casing shall be of high strength ductile casting and of such design that servicing can be carried out without disturbing connections.

1.1.2 Drive gear

Where the impeller is designed for operation at speed higher than the drive motor, necessary speed increasing gear shall be connected to the impeller shaft in a self aligning and balanced way. The gears and pinion shall be pressure lubricated.

1.1.3 Bearings:

The compressor shall incorporate the necessary design features to take both axial and radial thrusts. The bearings shall be of self aligning type. The bearing shall be pressure lubricated during operation and shall be completely sequenced and interlocked with the start up of the machine in such a way that oil pump should start earlier than the machine and the machine should start after some time, provided the

required oil temperature and pressure is maintained during the start up period.

1.1.4 Shaft seal:

The compressor shaft seal (in case of open type machines) shall be as per manufacturer's standard design. The seal should have small face area and low rubbing speed. It should provide an efficient seal under both vacuum and pressure lubricated during compressor operation. The seal must effectively prevent the leakage of refrigerant along the shaft during shut down periods. During operation an oil film should prevent outward leakage of refrigerant.

1.1.5 Lubrication system:

Lubrication system must ensure complete forced and speed lubrication (at a pressure and controlled temperature) to all bearing surfaces under any speed conditions, at start up, at shut down and during operation at various loads. Adequate arrangement shall be provided to take care of lubrication during failure of power or abnormal shutdown. Full lubrication must be available to the machine during acceleration and deceleration periods through an automatic auxiliary motor driven pump. The lubrication system should include the following:

- a) Filter mesh size shall be as per manufacturer's standard..
- b) Oil level indicator
- c) Oil coolers and oil heaters (with built-in thermostat to aid maintaining constant temperature)

1.1.6 The compressor shall be complete with all accessories such as drive arrangement (for open drive machines), capacity control and safety controls.

1.1.7 Capacity Control:

a) The compressor shall be equipped for modulating the capacity from 100% up to the 20% for stable operation without surging. The pre rotation vanes located at the impeller inlet for controlling the capacity shall be aerofoil shaped and shall be made as per manufacturer's standard. The vane position shall be controlled through hydraulic / linkage system. The unit shall be designed to unload up to 25% of its rated capacity at Constant Condenser Entering Water Temperature without surging and hot gas bypass.

b) The positioning of the vane shall be through microprocessor-based controller with its sensing elements in the outgoing chilled water lines. The automatic damper will enable maintenance of specified chilled water temperature within ± 0.11 deg C/ 0.2 deg F.

1.1.8 Safety Control:

Safety controls shall be provided as per details given under "Controls".

1.1.9 Interlocking

The compressor motor shall be interlocked with the following:

- i) Differential pressure switch in the chilled water line(s) in case of chilled water system, and air flow switch in the evaporator fan discharge in the case of direct expansion system.
- ii) Differential pressure switch in the condenser water line(s) in case of water cooled condenser and air flow switch in the condenser fan discharge in the case of air cooled condenser.
- iii) Anti-freeze thermostat in case of chiller.
- iv) Condenser water pump in case of water cooled condenser and condenser fan in case of air cooled condenser.
- v) Chilled water pump. The interlocks shall be provided with indicating lamps or flags in the control panel in the refrigeration plant room.
- vi) The interlocking of the motor with Differential pressure switch can be done at site.

1.1.10 Drive motor:

- i) The drive motor shall be an independent and coupler type or semi-hermetic / hermetic type depending on the design adopted by the manufacturer. The motor shall be suitable for continuous duty.
- ii) The electric motor shall be of squirrel cage type and shall be suitable for operation on 400/415 V \pm 10%, 3 phase, 50 Hz, Ac supply.
- iii) Synchronous speed of the motor shall not exceed 3000 RPM.
- iv) Continuous BHP rating of the motor shall not be less than the maximum power requirement of the compressor and drive under specified design conditions.
- v) The motor shall be fan cooled for open type chiller unit and refrigerant cooled for hermetic / semi hermetic type chiller unit. Space heaters with necessary controls shall be provided for open type motors.
- vi) Motor protection during over current shall be provided through winding temperature sensor in case of refrigerant cooled motors / current sensing in each phase through microprocessor in case of open type air cooled motors.
- vii) Power factor correction capacitors as required to maintain a displacement power factor of 95% at all load conditions shall be provided.

1.1.11 Motor starter

A variable speed drive will be factory fitted and supplied with the chiller. It will vary the compressor motor speed by controlling the frequency and voltage of the

electrical power to the motor. The capacity control logic shall automatically adjust motor speed and compressor pre-rotation vane position independently for maximum off design efficiency by analyzing information fed to it by sensors located throughout the chiller. Drive will be PWM type utilizing IGBT's with a power factor of 0.95 or better at all loads and speeds. The entire VFD will be UL listed. The following features will be provided:

- a) Door interlocked circuit breaker capable of being padlocked.
- b) UL /EN listed for safety
- c) Ground fault protection.
- d) Over voltage and under voltage protection.
- e) 3-phase sensing motor over current protection.
- f) Single phase protection.
- g) Insensitive to phase rotation.
- h) Over temperature protection.
- i) Digital readout at the chiller unit control panel of output frequency, output voltage, 3-phase output current, input Kilowatts and Kilowatt-hours. Separate meters for this information will not be acceptable.
- j) KW Meter, KWh Meter, Ammeter, Voltmeter & Elapsed Time Meter –Digital readout of all of them must be displayed via the main chiller control panel.

1.1.12 COP shall not be less than 6.5 while IPLV should be greater than 9.25, IKW/TR at design condition shall be less than 0.64. The chiller shall be ECBC compliant.

1.2 SCREW TYPE COMPRESSOR

1.2.1 The screw compressor shall have a rotary mono / twin screw, and may be of open / Semi sealed / totally (hermetic) sealed type. It shall be using refrigerant R-134a.

1.2.2 The mono/ twin rotary screw shall be manufactured from forged steel. The profile of screws shall permit safe operation up to a speed of 5000 RPM for 50 Hz operation. The compressor shall unload from fully loaded to the minimum capacity by means of hydraulically actuated slide valve positioned over the screw rotor/pilot operated solenoid valve.

1.2.3 The compressor housing shall be of high grade cast iron, machined with precision, to provide a very close tolerance between the rotor(s) and the housing.

1.2.4 The rotor(s) shall be mounted on antifriction bearings designed to reduce friction and power input. There shall be multiple cylindrical bearings to handle the radial and axial loads.

1.2.5 There shall be built in oil reservoir to ensure full supply of lubricants to all bearings and a check valve to prevent backspin during shut down.

1.2.6 There shall be oil pump or other means of differential pressure inside the compressor for forced lubrication of all parts during startup, running and during shut down. An oil sump header shall be provided.

1.2.7 The open type compressor shall also have a suitable shaft seal, to prevent leakage of

refrigerant.

1.2.8 The units shall be complete with automatic step-less capacity control mechanism to permit modulations between 20% to 100% of capacity range.

1.2.9 Interlocking It shall be as per details given in Para 1.1.9.

1.2.10 The driving motor shall be squirrel cage type hermetic/ Semi hermetic/ Open type as required, protected against damage by means of built in protection devices.

1.2.11 Compressor motor

i) The electrical motor driving the compressor shall be squirrel cage induction motor class 'F' insulation, fan cooled open type unit and totally enclosed (refrigerant cooled) for hermetic/ semi-hermetic unit. The motor shall be suitable continuous duty for operation on $415 \pm 10\%$ volts, 3 phase, 50 HZ alternating current supply, unless otherwise specified. The motor synchronous speed shall not exceed 3000 r.p.m.

ii) Continuous BHP rating of the motor shall not be less than the maximum power requirement of the compressor and drive under specified design conditions.

1.2.12 Motor starter

The starter shall be mounted on the main electrical control panel / unit mounted/ self mounted as specified. The starter for the motor shall be Star Delta close transition type. Starters shall be rated for intermittent duty. Starting current should not exceed two times the full load current.

The following protective devices will be factory mounted and wired to the starter:

- i. 3-leg sensing electronic overloads with indicating lights and reset button
- ii. Phase rotation protection circuit and indicating light
- iii. Single-phase failure protection circuit and indicating light
- iv. High temperature safety protection system with indicating light and reset button
- v. Hinged access door with lock and
- vi. High and low line voltage protection.

The following convenience items will be factory mounted and wired to the starter:

- a. Auxiliary 1-1/2 KVA transformer
- b. Digital Elapsed Time Meter
- c. Power Fault Protection, Electrical lugs
- d. 3-phase digital ammeter and digital voltmeter readout via control panel, KW Meter, KWh Meter & Ammeter
- e. Voltmeter Elapsed Time Meter

1.2.13 The COP shall not be less than 6.5. The chiller shall be ECBC compliant.

2.0 CONDENSER

2.1 Scope

This chapter covers the requirements of water cooled condensers suitable for screw and centrifugal types of refrigeration machines for central air-conditioning. The refrigerant side will be designed, tested and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII- Division 1. The condenser shall have a refrigerant relief device to meet the requirements of the ASHRAE 15 safety code for mechanical refrigeration.

2.2 Type: This section covers the following types of condensers:

Water cooled condensers, and Air cooled condensers.

2.3 Water Cooled Condensers

2.3.1 Rating

i) Where a water chilling unit is required, the condenser capacity shall match the compressor capacity specified in the tender specifications. The condenser shall be selected for 4.2 degree C temperature rise of water through the condenser unless otherwise specified in the tender specifications.

ii) The condenser shall be designed for a fouling factor of 0.001 (FPS) unless otherwise specified in the tender specifications.

Unless otherwise specified, the condenser shall be designed for entering water temperature of 32.2 degree C.

iii) Marine Water boxes shall be provided on condenser. Water boxes will be removable to permit tube cleaning and replacement. Stub out water connections having Victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.

2.3.2 Material and Construction

i) The condenser shall be Horizontal shell and tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.

ii) The shell of the condenser shall be made of MS of thickness not less than 8mm, with electric fusion welded seams. The shell capacity shall be such as to hold 1.25 times the refrigerant charge in the machine of which the condenser is a part, under pumped down conditions.

iii) The end plates of condenser shall be made of MS of thickness not less than 25mm.

iv) The condenser shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. Gauge.

v) The tubes shall be of seamless hard drawn copper and finned, unless otherwise specified. The minimum wall thickness shall be 1.0 mm with root thickness of 0.63 mm below the fins.

vi) Intermediate tube supports of steel shall be provided at no more than 1250 mm intervals to prevent sagging and vibration of the tubes. The condensers shall have water boxes designed for multi pass flow.

vii) The tubes may be provided with special tabulating arrangement to improve heat transfer where such an arrangement is a standard design of the manufacturer.

viii) The condensers shall be provided with removable heads on either side made of cast iron or mild steel with neatly machined surface for effective jointing with the shell for easy accessibility for leaning/replacement of the tubes. Suitable baffles shall be incorporated to achieve the required number of passes. It should be possible to de-scale the tubes without disconnecting the water line connections, wherever marine water boxes have been specified in the tender documents.

ix) The condenser shall be provided with baffle arrangement for preventing direct impingement of hot gas over the tubes and to enable even distribution of the gas over the tube bundles.

x) The condenser shall include necessary provision for sub-cooling of the refrigerant where the refrigerating machine is selected with such sub-cooling requirement. The arrangement shall be such that the cold water entering the condenser first cools the liquid refrigerant in the sub-cooler.

xi) The condenser shall be sand blasted from both inside & outside.

xii) Sight glass to check the level of refrigerant

2.3.3 Connections and Accessories

The condenser shall be provided with the following connections and accessories and conforming to Section "Refrigerant Piping" where applicable:

a) Hot gas inlet and liquid outlet connections. The liquid line connections shall be provided with isolating valves.

b) Water inlet and outlet connections

c) Pressure relief device,

d) Drain connection with valve for water side.

e) Differential flow switch pressure switch/flow switch/ flow sensor in the water line(s).

2.3.4 Pressure Testing

a) The condenser shall be tested at the works to 1.5 times the maximum working pressure for the refrigerant specified in the tender specifications or 15 kg/sq.cm. (Pneumatic) for refrigerant R-134a, whichever is higher.

b) The water side of the condenser shall also be tested to a hydraulic pressure of 10

kg./sq.cm.in the works.

c) Pressure test certificates shall be produced in respect of each condenser.

2.4 CHILLER

2.4.1 Scope

This chapter covers the requirements of chillers suitable for centrifugal and screw types of refrigerating machines for air-conditioning. The refrigerant side shall be designed in accordance with ASME standards (Boiler and pressure vessel) code, Section VIII - Division 1. The evaporator shall have a refrigerant relief device to meet the requirements of the ASHRAE 15 safety code for mechanical refrigeration.

2.4.2 Types

This section covers the shell and tube type water chillers.

2.4.3 Flooded type shell and tube Type Water Chillers

2.4.3.1 Rating

i) In a package water chilling machine, the chiller shall match the compressor capacity specified in the tender specifications. The chiller shall be selected for 5.5 deg C temperature drop of water through the chiller.

ii) The fouling factor shall be 0.0005(FPS) unless otherwise specified in tender specifications.

2.4.3.2 Material and Construction

i) The water chiller shall be horizontal, shell end tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.

ii) The chiller shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. Gauge.

iii) The end plates of chiller shall be made of MS of thickness not less than 25mm.

iv) The shell of the chiller shall be made of MS of thickness not less than 8 mm with electric fusion welded seams.

v) The tubes shall be of seamless, hard drawn copper. The minimum tube wall thickness shall be 0.71 mm for plain tubes and minimum 0.63 mm at the root of fins.

vi) The tubes may be either plain or internally finned as per manufacturer's design.

vii) The tubes shall be rolled into grooves in the tube sheets and flared at ends.

viii) Intermediate tube supports of steel or polypropylene shall be provided at spacing not less than 1250 mm to prevent sagging / vibration of tubes.

- ix) The flooded chillers shall have water boxes designed for multi-pass flow.
- x) The chiller shall be smooth finished with one coat of paint as per manufacturing practice before the insulation is applied.
- xi) The chiller shall be sand blasted from both inside (before insertion of tubes) & outside.
- xii) Sight glass to check the level of refrigerant

2.4.3.3 Connections and Accessories

The Chiller shall be provided with the following connections and accessories and conforming to section "Refrigeration Piping" where applicable

- a) Refrigeration inlet and outlet connections.
- b) Liquid refrigerant float for level control expansion valve/ fixed or variable orifice.
- c) Pressure relief device.
- d) Charging connection with valve.
- e) Eliminator plate.
- f) Drain and vent connections with valves
- g) Water inlet and outlet connections .Water boxes will be removable to permit tube cleaning and replacement. Stub out water connections having Victaulic grooves will be provided. Vent and drain connections with plugs will be provided on each water box.
- h) Proper oil return system.
- i) Flow switch/pressure switch/differential flow switch/ flow sensor in the water line (s).

2.4.3.4 Pressure Testing

- a) The chiller shall be tested in the works to 1.5 times the maximum working pressure for the refrigerant specified in the tender specifications or 21 kg./sq.cm. (Pneumatic), whichever is higher.
- b) The water side of the chiller shall also be tested to a hydraulic pressure of 10 kg./sq.cm. at the works.
- c) Pressure test certificates shall be produced in respect of each chiller.

2.4.3.5 Insulation

The insulation shall be done as per manufacturer standard.

2.5 REFRIGERANT PLUMBING

2.5.1 Design aspects of Refrigerant Plumbing

- i) Refrigerant piping shall be designed and installed so as to:

- a) Ensure circulation of adequate refrigerant at all loads.
- b) Ensure oil return to crank case of compressor positively and continuously.
- c) Keep pressure losses within limits, especially in suction lines.
- d) Prevent oil/liquid refrigerant from entering the compressor when the compressor is working as well as when it has stopped.
- e) Prevent trapping of oil in evaporator or suction lines, which may return to the compressor in the form of slug.

ii) Hot gas lines:

Oil shall be entrained and carried by hot gas under all load conditions likely to be encountered in normal operation.

iii) Liquid Lines:

- a) Liquid lines shall be designed to ensure that flashing of liquid refrigerant does not occur by minimizing the pressure drop suitably, by avoiding long vertical risers, and appropriate sub cooling.
- b) Each liquid line shall be provided with a permanently installed refrigerant drier of throw away or rechargeable type. The drier shall be installed in a valved line.
- c) Flow indicator (moisture indicating type) shall be installed on all liquid lines.

iv) Suction Lines:

- a) Oil shall be entrained and carried by the suction gas under all conditions of load likely to be encountered in normal operation.
- b) Piping shall be designed for a suitable velocity of refrigerant (similar to hot gas line) to ensure that oil will not separate from the gas and drain to the compressor in slugs.
- c) The refrigeration system shall be equipped with controls for pump down system so that the evaporator and suction line are emptied before the compressor shuts off, thus preventing liquid refrigerant and oil from entering the compressor when restarted.

d) Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg. per sq.cm.(3 psi).

v) Isolating valve shall be provided to enable isolation of each compressor in case of multiple compressor units (as built in valves), strainer, drier and any other components as may be required for proper operation and maintenance.

vi) Thermostatic expansion valve/float valve shall be provided in refrigerant circuit.

2.5.2 Material

i) Fittings like bends, tees, sockets etc. shall be of wrought copper or forged brass and shall be suitable for the duty involved. Flare type compression fittings of forged brass shall be allowed up to 15 mm piping size. Tubes up to and including 15 mm size may be bent to form 90 degree bends with inside radius not less than 3 tube diameters. For bigger sizes, bend fittings as mentioned above must be used.

ii) Where specified in the tender specification, mild steel may be provided for refrigeration piping, with seamless MS tubes and fittings of heavy class conforming

to IS: 1239. All liquid lines and instruments lines shall however be of copper only.

iii) Refrigerant plumbing for centrifugal/screw type chilling machine shall be of mild steel or wrought iron/copper to manufacturer's standards.

iv) Valves shall be of the packed, back-seating type for both copper and MS refrigerant plumbing work, and these shall be of forged or cast brass construction.

2.5.3 Pressure Testing

i) After completion of the piping installation, the entire chilling unit shall be pressure tested with dry nitrogen or any other inert gas at the following pressures:

Pressure (Kg./Sq.cm.)

High pressure side

20

Low pressure side

8

This test shall be carried out as follows:

a) The system shall be charged with nitrogen or inert gas to 1.0 Kg./sq.cm. gauge and all joints shall be checked for leakage with a mixture of four part water, one part liquid soap and a small amount of glycerin. Leaks shall be marked, pressure released and repairs done. Brazed joints, which leak, shall be opened and redone. These shall not be repaired by addition of brazing alloy to the joints.

b) The system shall now be charged with nitrogen or the inert gas to the pressure specified in the above table and the process of locating leaks and repairs shall be repeated.

c) Final pressure test:

After all the leaks have been repaired, the system shall be retested with the test pressure maintained for a period of not less than 8 hours. No measurable drop in pressure should be detected after the pressure readings are adjusted for temperature changes. Pressure gauges, controls and compressors may be valved off during pressure testing.

2.6 MICROPROCESSOR CONTROLLER

2.6.1 Each chilling unit shall be complete with a microprocessor based interactive control console in a locked enclosure factory mounted (directly on the unit), prewired with all operating and safety controls and tested.

2.6.2 It will provide start, stop, safety, interlock, capacity control and indications for operation of the chiller units through alphanumeric/graphical display.

2.6.3 Controls shall provide to view and change digital programmable essential set points, cause of shutdown and type of restart required.

a) Leaving chilled water temperature,

b) Percent current limit.

c) Remote reset temperature range.

2.6.4 All safety and cycling shutdowns shall be enunciated through the alphanumeric/graphical display and consist of day, time, cause of shutdown and type of restart required.

- 2.6.5 Cycling shutdown shall include low leaving chilled water temperature, chiller/condenser water flow interruption, power fault, internal time clock and anti-recycle.
- 2.6.6 Safety shutdowns shall include low oil pressure, high compressor discharge temperature, low evaporator pressure, motor controller fault and sensor malfunctions.
- 2.6.7 The default display screen shall indicate the following minimum information
- i) Date and time
 - ii) Return and leaving chilled water temperatures
 - iii) Return and leaving condenser water temperatures
 - iv) Differential oil pressure
 - v) Percent motor rated current
 - vi) Evaporator & condenser refrigerant saturation temperatures
 - vii) Chiller operating hours (hour run) and
 - viii) Number of compressor starts
 - ix) Oil sump temperature
 - x) Status message
- 2.6.8 Security access shall be provided to prevent unauthorized change of set points, to allow local or remote control of the chiller and to allow manual operation of the prorogation vanes and oil pump.
- 2.6.9 The chiller shall be provided with ports compatible with any building management system offered, to output all system operating information, shutdown/cycling message and a record of last four cycling or safety shutdowns to a remote printer (option) . The control centre shall be programmable to provide data logs to the printer at a set time interval.
- 2.6.10 Control centre shall be able to interface with an automatic control system to provide remote chiller Start/stop; reset of chilled water temperature, reset of current limit, and status messages indicating chiller is ready to start, chiller is operating, chiller is shut down on a safety requiring reset and chiller is shut down on a recycling safety.
- 2.6.11 The microprocessor control system shall include the interlocking of compressor motor with chilled and condenser water flows, guide vane position of compressor in case of centrifugal units and lubricating oil pump pressure.
- 2.6.12 On initiation of start, the microprocessor control system shall check all prestart safeties to verify that all prestart safeties are within limits. (If one is not, an indication of the fault will be displayed and the start aborted).

2.7 INSTALLATION

- i) The complete chilling unit shall be installed over a RCC foundation and shall be adequately isolated against transmission of vibrations to the building structure. MS angle 50*50*6 mm shall be fixed all around top edges of such foundation. Where spring mountings are used for vibration isolation, these shall be complete with leveling screws and lock nuts and shall be placed over a concrete plinth for distribution of the mass of the assembly over the plant room floor.

Special attention shall be paid to the alignment of the driving and driven shaft. Final alignment shall be checked at site in presence of the Engineer-in-charge using a dial indicator. Necessary foundation bolts, nuts, leveling screws etc wherever required for mounting the unit shall be provided by the contractor.

2.8 PAINTING

The equipment shall be supplied as per manufacturer's standard finish painting.

Data Point Summary for Plant Manager

Sr. No	Description	Qty	Total Points					Required signal
			DI	DO	AI	AO	SW	
A	Chiller Plant (Water Cooled Chiller)	4						
1	Chiller On/Off command			0			4	Software Integration signal
2	Chiller Run status		0				4	Software Integration signal
3	Chiller Fault/Alarm status		0				4	Software Integration signal
4	Chiller CHW Temperature Reset Setpoint					0	4	Software Integration signal
5	Chiller Current Limit Setpoint					0	4	Software Integration signal
6	Chiller inlet isolation valve Open/Close command			4				NO/NC Relay Command to Valve
7	Chiller inlet isolation valve Open/Close status		4					NO/NC Potential free contact from Valve
8	CW inlet isolation valve Open/Close command			4				NO/NC Relay Command to Valve
9	CW inlet isolation valve Open/Close status		4					NO/NC Potential free contact from Valve
10	Common CHW supply header temperature				1			
11	Common CHW return header temperature				1			
12	Outside Air Temp/Humidity				2			0-10VDC from RH cum temp sensor
#	Total points for Chiller Plant		8	8	4	0	20	
B	Primary Chilled Water Pumps (PCHP)	4	DI	DO	AI	AO	SW	
1	Pump Auto/Manual status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command			4			0	NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
4	Pump trip status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Chilled Water Pumps		12	4	0	0	0	
C	Condenser Water Pumps (CWP)	4	DI	DO	AI	AO	SW	
1	Pump Auto/Manual status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command			4			0	NO/NC Potential free contact from MCC Panel/Pump VFD

3	Pump run status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
4	Pump trip status		4				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Condenser Water Pumps		12	4	0	0	0	
D	Cooling Tower (CT)	4	DI	DO	AI	AO	SW	
1	Fan Auto/Manual status		4				0	NO/NC Potential free contact from MCC Panel/CT VFD
2	Fan On/Off Command			4			0	NO/NC Potential free contact from MCC Panel/CT VFD
3	Fan Run status		4				0	NO/NC Potential free contact from MCC Panel/CT VFD
4	Fan Trip status		4				0	NO/NC Potential free contact from MCC Panel/CT VFD
5	CT inlet/outlet Isolation valve Open command			4				TE-632AM-1+WZ 1000-5
6	CT inlet/outlet Isolation valve Open/close status		4					TE-632AM-1+WZ 1000-5
7	Common CW supply header temperature				1			NO/NC Relay Command to Valve
8	Common CW return header Temperature				1			NO/NC Potential free contact from Valve
#	Total points for Cooling Tower		16	8	2	0	0	
E	Secondary Chilled Water Pumps (SCHWP)	7	DI	DO	AI	AO	SW	
1	Pump On/Off command			7			0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump run status		7				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Chilled Water Pumps		7	7	0	0	0	
F	Tertiary Chilled Water Pumps (TCHWP)	7	DI	DO	AI	AO	SW	
1	Pump On/Off command			7			0	NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump run status		7				0	NO/NC Potential free contact from MCC Panel/Pump VFD
#	Total points for Chilled Water Pumps		7	7	0	0	0	
G	Chiller Diagnostic Points (including VFD) from main chiller control panel	4	DI	DO	AI	AO	SW	
1	Leaving chilled liquid - setpoint						4	
2	Motor current limit -setpoint						4	
3	Leaving chilled liquid - temperature						4	
4	Entering chilled liquid - temperature						4	
5	Leaving condensor liquid - temperature						4	

6	Entering condensor liquid - temperature					4	
7	% Amps					4	
8	RLA					4	
9	VFD Frequency					4	
10	Evaporator pressure					4	
11	Condensor pressure					4	
12	Oil – low differential pressure					4	
13	Motor FLA current					4	
14	Discharge pressure					4	
15	Operating hours					4	
16	Unit safety fault code					4	
17	Unit cycling fault code					4	
18	Opreation code					4	
19	Evaporator – low pressure					4	
20	Evaporator – low-pressure – smart freeze					4	
21	Evaporator – transducer or leaving liquid probe					4	
22	Condenser – high pressure					4	
23	Condenser – pressure transducer out of range					4	
24	Discharge – low temperature					4	
25	Oil – high temperature					4	
26	Oil – low differential pressure					4	
27	Oil – clogged filter					4	
28	Motor controller – loss of current					4	
29	Oil – high pressure					4	
30	Oil – separator – low level					4	
31	Leaving chilled liquid - low temperature					4	
32	Motor controller – loss of current					4	
33	Sys Oil Temperature					4	
34	Sys Oil Pressure					4	
35	Sys Oil Filter Pressure					4	
36	Slide Valve Position					4	
37	Sys Discharge Temp					4	
38	SYS.EVAPORATOR SATURATION TEMPERATURE					4	
39	SYS.EVAPORATOR SUB TEMPERATURE					4	
40	SYS.CONDENSER SATURATION TEMPERATURE					4	
41	EVAPORATOR					4	

	REFRIGERANT TEMPERATURE							
42	EVAPORATOR SMALL TEMPERATURE DIFFERENCE						4	
43	CONDENSER SMALL TEMPERATURE DIFFERENCE						4	
44	SYS. START TIMES						4	
	Total diagnostic points						176	

AIR HANDLING UNITS

1. General:

The air handling system shall be complete in all respects and shall generally comply with the specifications as given in the following paragraphs.

2. Air Handling Units: (Double skin type)

The air handling units shall be double skin, fully enclosed, sectionalised type construction, draw thru type and shall include mixing section, coil section, fan section, filter section with filters etc. The unit shall be of floor mounted design installed on spring/vibration isolators/mountings for limiting vibration to the civil structures.

2.1 Fan Section

Fan shall be centrifugal with backward inclined blades direct shaft driven or belt driven. Fan casing shall be made of galvanised steel sheet. Fan wheels shall be made of galvanised steel. Fan shaft shall be ground C40 carbon steel and supported in pre-greased ball bearings operating less than 75% of first critical speed. Fan wheels and pulleys shall be individually tested and precision balanced dynamically. The fan shall be selected for a fan speed not exceeding 1000 rpm for fan dia of more than 350 mm and fan outlet velocity shall not exceed 1800 fpm. The fan outlet shall be connected with casing with the help of fire retardant canvas.

2.2 Coil Section

The cooling coil shall be of seamless copper tubes, not less than 0.5 mm thick and 12 mm dia with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 150 MPM. The coil shall be pitched in the unit casing for proper drainage. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The fins shall be uniformly bonded to the tubes by hydraulic mechanical expansion of the tubes. For coastal areas the fins shall be phenolic coated and for 100% fresh air application fins shall be hydrophilic type. Fin spacing shall not exceed 5 fins per cm. The cooling coil shall be AHRI / Eurovent certified. The coiling coil assembly shall be on aluminium rails and nylon rollers for easy withdrawal from either side.

The coils shall be tested against leaks at 21 kg/sq.cm air pressure under water. This pressure shall be maintained for a period of at least 2 hours. No drop should be observed indicating any leaks. Min.250 mm spacing shall be maintained between the coils. 8 row shall be 4+4 construction.

The water headers shall be of copper to connect all the tubes. The headers shall be complete with water in/out connections, vent plug on top and drain at the bottom.

The coil shall be designed to provide water velocity between 0.6 to 1.8 m/s (2 to 6 fps).

2.3 **Filter**

Each unit shall be provided with a factory assembled filter sections containing washable synthetic type air filters. Filter framework shall be duly sealed and constructed from aluminium alloy. The media shall be supported with hdp mesh on one side and aluminium frame mesh on other side. Filters face velocity shall not exceed 500 fpm. Filters shall fit so as to prevent by pass. Holding frames shall be provided for installing a number of filters cells in bank. These cells shall be held within the frames by sliding the cells between guiding channels.

2.4 **Housing/ Casing**

The casing shall be of sandwich panels fixed on modular frame design The frame work shall be of extruded aluminium hollow section duly powder coat painted/ anodized fitted with extruded Aluminum corner pieces and insulated with 25 mm PUF pressure injected having density 38-40 Kg/m³ insulation. The structure shall be having thermal break profile for total unit. Panels shall be made of 25 mm thick (overall) sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. For units installed outdoor, the thickness of double skin panels shall be minimum 40 mm. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corners. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of pre coated CRC sheet of 0.8 mm thickness chemically treated, having scratch free pre plasticized coating and 0.8 mm GI inner sheet. The AHU shall be provided with electrical power/control junction box on external side of the unit conveniently mounted for cable connections.

Frame work for each section shall be bolted together with non hygroscopic gasket in between to make the joints air tight, suitable doors with chrome plated hinges and latches shall be provided for access to various panels for maintenance. The entire housing shall be mounted on steel channel frame work.

Units shall have hinged, quick operating access door in the fan section etc. The access doors shall also be double skin type similar to the casing.

Drain pan shall be constructed of 1.25 mm thick SS 304 sheet with necessary dual slope to facilitate fast removal of condensate. It shall be isolated from the bottom floor panels through 15 mm thick PUF insulation.

2.5 **Mixing Box**

The construction of this section is same as unit but will have airfoil blade design opposed blade dampers for Return Air, Fresh Air and Exhaust Air as may be required. The casing and frame shall be same as the casing of AHU. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of galvanized sheet chemically treated, having scratch free pre plasticized coating and pre coated GI inner sheet.

2.6 **Fan Motor and Starter**

The totally enclosed fan cooled squirrel cage fan motor shall have a minimum rating as given under "Schedule of Equipments and the starter rating shall match the motor rating and both control panel shall conform to the specifications under "Motors and Switchgears". Drive to fan shall be provided through belt-drive arrangement. Belts shall be of oil resistant type.

2.6 **Controls**

Each air handling unit shall be provided with a modulating valve motor and modulating thermostat, conforming to specifications under "Controls".

2.7 **Fresh Air Controls**

An adjustable motorised damper of aluminium sheet along with bird screen air inlet louvers shall be provided for fresh air entry.

2.8 **Accessories**

Each air handling unit shall be complete with: -

-Stem type thermometer at coil inlet and outlet. (Included in AHU's)

-Pressure gauges with cocks at inlet and outlet of the coil. (Included in AHU's)

-Balancing valves at coil outlet and butterfly valves at coil inlet & outlet. (priced separately)

-Drain line from unit to drain trap. (priced separately)

-Flexible connection between fan outlet and duct.

-Vibration isolators of high efficiency.

-Ports shall be provided across fine and HEPA filter with Magnehlic gauges to measure pressure drop with bibcock. (Included in AHU's)

2.9 Testing

Air handling units shall be tested to measure air quantity and coil performance by measuring temperature difference and then calculating capacity by using the above measurements.

2.10 Limitations

The air velocity across the cooling coil shall not exceed 500 fpm.

The fan outlet velocity shall not exceed 1800 fpm

The air velocity across the filters shall not exceed 500 fpm.

3. Ceiling Suspended Air Handling Units: (CSU)

The unitary type air handling unit shall be compact, double skin, self contained and shall consist of blower assembly, cooling coil, air filter, drive and motor all enclosed in an attractive sheet steel housing

The blower assembly shall consist of forward curved, double inlet, double width impeller, blower housing of mild steel with smooth air inlet volutes, self aligning bearing block and supports for mounting the bearing on the blower housing.

The cooling or heating coil shall be of seamless copper tubes not less than 12 mm o.d. and 0.5 mm thickness. The coil shall have continuous aluminium plate fins. The fins shall be spaced by collars forming an integral part of the fins. The tube shall be staggered in the direction of air flow. The coil circuit should be sized for adequate water velocity but not exceeding 1.8 m/s (6 F.P.S.). The fins shall be uniformly bonded to the tubes by hydraulic expansion of the tubes. The water headers shall be of copper pipe to connect all the tubes. The header shall be complete with water in/out connection vent plug on top and drain at the bottom.

The air filter shall be of metallic viscous type with a minimum depth of 50 mm. The air filter shall consist of 24 gauge wire mesh in at least five layers with outer casing of 20 ga m.s. sheet formed into channels. Both side of filter shall have expanded metal screens.

The fan motor shall be squirrel cage totally enclosed fan cooled type with suitable starter conforming to specification under "Motor and Switchgears".

The fan drive shall consist of grooved motor pulley, blower pulley and v belt, along with adjustable mounting for the motor.

All the above components shall be housed in a G.I. sheet steel housing made of 1.2 mm (20 ga) sheets, suitably reinforced to provide rigidity. Access panel to coil and fan areas shall be hinged for ease of maintenance.

3.1 **Controls**

Each unitary unit shall be provided with a heating/cooling snap acting thermostat and a 3 way water solenoid valve, conforming to specifications (wherever given in schedule of prices).

3.2 **Fresh Air Control**

An adjustable manual damper of aluminium sheet along with a bird screen on the outside wall shall be fixed in the opening provided for this purpose in the air handling unit room.

3.3 **Accessories**

Each air handling unit shall be complete with

One stem type thermometer for coil inlet and outlets, with tubing and gauge cocks. (Included in AHU's)

One pressure gauge with cock for inlets and outlets of the coil, with tubing and gauge cocks. (Included in AHU's)

Balancing valve at coil outlet and butterfly valves at coil inlet & outlet (priced separately)

Drain line from unit to drain trap (priced separately)

Flexible connection between fan outlet and duct.

Vibration isolators of atleast high efficiency.

3.4 **Testing:**

The air handling unit shall be tested to measure air quantity and coil performance by

measuring temperature difference, water pressure drop across coil and then calculating the capacity by using the above measurements.

3.5. **Limitations:**

The air velocity across the cooling coil shall not exceed 500 FPM.

The fan outlet velocity shall not exceed 1800 FPM.

The air velocity across the filters shall not exceed 500 fpm.

4.0 **FILTERS**

4.1 **General**

This section covers the general requirements for special type of filters to be installed in air moving equipment or air ducts.

4.2 **Pre-filters (fabric type)**

Synthetic fibre Pre-filters shall be in light weight aluminium framed with non woven synthetic fibre replaceable media minimum 50 mm thick, shall be provided on suction side of AHU as standard equipment with the unit. These filters shall have the efficiency of 90 percent down to 10 microns particles size when tested as per B.S.2831 standards. The filter frame shall be of aluminium and shall be suitable for mounting in Air handling units or ducts as required at site. The velocity across the face of the filter shall not exceed 500 FPM and the pressure drop across the filter shall not exceed 4mm. The filters shall be suitable for operation under 100 percent relative humidity and 120 deg.C temperature conditions.

4.3 **Fine filters (MERV-14)**

Microvee filters shall be of dry type. Filters media shall be made from washable non woven synthetic fibre replaceable media reinforced with HDPE cloth & Aluminum mesh, specially treated with antifungal and bactericidal agents to prevent growth of micro organisms. The filter media shall be treated to permit washing with water several times before discharged. The media shall be properly supported and spaced so that air flow through the filter is uniform. The filter shall be housed in aluminium frame work after the coils. Filters shall be designed to remove particle down to 3 micron size and with efficiency of 99 percent tested as per BS 2831 using Test Dust II. The filters shall be installed in the air handling units after the chilled water coils and fan section and are always backed by pre-filters provided on the suction side of the AHU. Face velocity across these filters shall not exceed 500 FPM. They shall be capable of being replaced or removed for servicing without the use of special tools.

4.4 **High Efficiency Particulate Absolute (HEPA) Filters (MERV-17)**

HEPA filters shall be made in extended surface configuration of deep space folds of sub micron glass fibers. The filter media shall be housed in an aluminium sheet frame provided with double turned flanges and closed cell neoprene gasket. The filter media shall not absorb moisture, stretch, swell or undergo chemical change with moisture. The filter shall be resistant to fungus and bacterial growth. Filters shall be free from pin holes and other leaks.

The housing shall be designed to install the HEPA filters in the terminal locations in the false ceiling or in the Filter section of the AHU after fan section so that it is removed easily without risking the infiltration of dust whatsoever. The arrangement for filters shall be strictly in accordance with the manufacturer's recommendations and shall be approved by the engineer prior to fabrication and installation. The filters shall be protected with aluminium slotted protective grille from the bottom in case of installation of filters in false ceiling air terminals. All MS parts shall be de rusted and shall be epoxy painted. The aluminium grilles shall be made from 1.6 mm aluminium sheets with minimum clear area of 60 percent. The grilles shall be anodised stove enamel painted as approved by the Engineer. Face velocity across these filters shall not exceed 500 FPM.

DUCTABLE SPLIT UNITS WITH AIR COOLED CONDENSERS

1.0 Scope

The scope of this section comprises the supply, installation, testing and commissioning of factory built self contained air cooled condenser type ductable split air conditioners complete in all respects and generally in conformity with these specifications, requirements of drawings Schedules of equipment and Bill of Quantities.

2.0 Components of Machines

Each ductable split air conditioners shall be complete with hermetic type compressor/s, DX type air cooled condenser, evaporator/ chiller, compressor motor, interconnecting refrigerant piping with valves and strainers etc. refrigerant controls and accessories, gauge panel, motor starters and electrical controls, safety controls and devices and first charge of refrigerant, oil etc.

3.0 Condensing Units

- 3.1 Each condensing units shall be complete unit with hermetic compressor/s, air cooled condenser, condenser fans with motors, internal piping , switches and internal wiring and shall be enclosed in a weather proof outdoor type housing.
- 3.2 The compressor shall be hermetic, with enclosed gas cooled motor. The compressors shall be suitable for R-134a / R-410a.
- 3.3 The condenser coil shall be air cooled type with aluminium fins and copper tubes and necessary refrigerant connections. The copper tubes shall not be less than 3/8” O.D.
- 3.4 The condenser air fans shall be propeller type direct driven, each complete with motor. The air quantity and area of the condenser shall be adequate for working in the specified out door conditions.
- 3.5 The casing shall be fabricated from galvanized steel, zinc phosphated and finished with baked enamel paint. The casing shall make the whole unit fully weather proof suitable for outdoor installation.
- 3.6 The unit shall include a remote control assembly with thermostat and starting and speed switches.
- 3.7 The necessary charge of refrigerant gas and lubricated oil shall be provided to run the system.

4.0 Ductable Cooling Unit:

- 4.1 The cooling unit shall be matched to the respective condensing unit and shall consist of cooling coil, blower, filters, outer casing, drain pan, accessories etc.
- 4.2 The cooling coil shall have copper tubes of not less than 3/8" o.d. and continuous aluminium plate fins with integral collars. The tubes shall be staggered in the direction of the air flow.
- 4.3 The fan section shall comprise of aluminium centrifugal blower/s, statically and dynamically balanced, motor, drive package, mounting arrangement etc.
- 4.4 The unit casing shall be made of galvanized steel, the casing shall be insulated to lower the noise level and eliminate condensation.

5.0 Refrigerant Piping

- 5.1 The condensing unit and evaporator unit shall be interconnected by type '1' seamless copper refrigerant liquid and suction lines using flared or brazed fittings. Necessary accessories shall be incorporated in the circuit.
- 5.2 Valves used in the Refrigerant piping shall be of the packed, back seated type and shall be of forged /cast brass/bronze construction. All joints of steel to steel piping shall be welded and steel to Brass/Copper shall be silver brazed. Care shall be taken to remove the burr and dirt from the pipe ends and form proper 'V' at the mating ends before welding.
- 5.3 Flare type compression fittings shall be allowed upto 15mm piping diameter only for which annealed copper tubing shall be used.
- 5.4 Refrigerant piping shall be complete with the following accessories (but not limited to)
 - 5.4.1) Hot Gas line muffler.
 - 5.4.2) Liquid line strainer cum drier with disposable type of cover, with a bypass line with valve.
 - 5.4.3) Liquid line sight glass.
 - 5.4.4) Liquid Line solenoid valve.
 - 5.4.5) Thermostatic expansion valve.
 - 5.4.6) Liquid line Refrigerant Grade valves as required.
 - 5.4.7) Shut off valves on compressor.
- 5.5 Refrigerant Suction Gas to liquid heat exchanger, if provided, shall be tube in tube type fabricated out of M.S. heavy class seamless pipes conforming to IS 1239.

5.6 The suction line shall be insulated with 6mm rubber foam insulation.

6.0 Fresh Air Intake Arrangement

An adjustable manual damper of M.S. sheet along with bird screen, air inlet louvers shall be provided for fresh air entry.

7.0 Miscellaneous

7.1 The unit shall have control panel, housing the starting switches, contactor, relays etc.

7.2 Isolation pads shall be provided under the units

7.3 Drain line shall be provided from indoor unit upto drain point

7.4 Suitable M.S. angle iron supporting frame shall be provided for the condensing units and supporting arrangement for the indoor units.

7.5 Interconnecting power and control cabling shall be provided between condensing unit and evaporator unit and cabling between the main control panels to the units

8.0 Testing and Commissioning

8.1 The refrigeration system shall be thoroughly tested for any leaks by pressurising with dry nitrogen to a pressure of 350 PSIG. Each joint and flare connection shall be checked for any leakage with soap solution. Any leaks shall be rectified and the above process shall be repeated till no leak is detected. The pressure in the system should stand for 1 day.

8.2 The system shall then be vacuumized to 7.6mm Hg absolute and maintained at this level for 4 - 6 hours. Thereafter the vacuum pump shall be stopped and vacuum maintained for 24 hours. Pressure rise should not exceed 2.5mm of water absolute.

8.3 The vacuum shall then be broken with dry nitrogen and system again vacuumized to 7.6mm Hg maintained for 4 hours. This procedure shall be repeated for a third time before charging refrigerant gas.

8.4 The contractor shall set all safety and capacity controls and interlocks, properly and a record of all settings shall be furnished before commissioning the plants.

8.5 Testing and commissioning shall be carried out in the presence of Architect/Consultant or his representative to his entire satisfaction.

9.0 Painting

All equipments, including mounting frames and interconnected piping etc shall be painted with two coats of approved enamel paint.

DX TYPE AIR COOLED PRECISION UNITS

1.1 General:-

The room air-conditioning system shall be a floor discharge unit designed specifically for high sensible heat ratio applications such as Server, Computer rooms and UPS room etc.

Each unit shall be capable of providing sensible cooling capacities at rated ambient temperatures with adequate airflow. Each unit shall be capable of providing actual cooling capacity as mentioned in the schedule of quantities.

Inside Conditions: - 22+ 1 0C and relative humidity is 50 + 5% RH.

The system shall contain Scroll compressor, Evaporator, Humidifier, Condenser and an Externally Equalized Thermostatic expansion valve (TXV) all of which shall be contained within the cabinet of the unit.

1.2 Cabinet Construction:-

The frame shall be constructed of Galvanised steel & shall be double skin type. The external panel shall be constructed of 1.2mm zinc coated sheet steel. Front, rear and end panels shall be fitted with 25mm glass fibre insulation, fire rated .The cabinet shall be powder coated and have a textured finish. The hinged front panel shall be removable and include captive ¼ turn fasteners. The cabinet shall be assembled with pop rivets providing ease of disassembly.

1.3 Filtration:-

The filter chamber shall be an integral part of the system and withdraw able from the front of the unit. Filtration shall be provided by deep V form G4 performance dry disposable media to AS1324.

1.4 Fans:-

The fan section shall be designed for an external static pressure of 25 Pa. The fans shall be located downstream of the evaporator coil and be of the forward curved centrifugal type, double width, double inlet and statically and dynamically balanced to G6.3DIN ISO 1940 part I. Each fan shall be separately driven by a high efficiency electric motor with an **IP55 enclosure rating**. The drive arrangement shall be self-tensioning and provide for belt replacement without the use of tools. The motor base plate shall include locators to ensure optimum axial alignment of the motor.

1.5 Humidifier:-

Humidification shall be provided by boiling water in a high temperature polypropylene steam generator. The steam shall be distributed evenly into the bypass airstreams of the environment control system to ensure full integration of the water vapor into the supply air without condensation. The humidifier shall be capable of providing 7.5 kg of steam per hour. The humidifier shall have an efficiency of not less the 1.3 kg/kw and be fitted with an

auto flush cycle activated on demand from the microprocessor control system. The humidifier shall be fully serviceable with replacement electrodes. Wastewater shall be flushed from the humidifier by the initiation of the water supply solenoid water valve via a U-pipe overflow system. Drain solenoid valves will not be used.

1.6 Electrical Heating:-

The electric heating elements shall operate at a heat density level not exceeding 60 kW/ m². The low watt density elements shall be of finned tubular steel construction finished in high temperature paint.

The heating circuit shall include dual safety protection through loss of air and manual reset high temperature controls.

1.7 Compressorised systems:-

a. Scroll Compressor:-

The compressor shall be of the high efficiency complaint scroll design with an E.E.R. (energy efficiency ratio) of not less than 3.25) at ARI rating conditions. The compressor shall be charged with mineral oil and designed for operation on HCFC R407c. Each compressor shall have internal motor protection and be mounted on vibration isolators.

b. Refrigeration Circuit:-

The refrigeration system shall be of the twin circuit direct expansion type and incorporate hermetic scroll compressors, complete with crankcase heaters. Cooling steps shall be a maximum of 50% of total unit cooling capacity for one and two compressor models. The system shall include a manual reset high pressure control; auto reset low temperature switch, externally equalized thermal expansion valve, high sensitivity refrigerant sight glass, large capacity filter drier and charging/access ports in each circuit. Each refrigeration circuit shall include rigidly mounted isolation valves in the discharge and liquid lines to aid servicing and installation (air cooled units only).

1.8 Evaporator Coil:-

The evaporator coil shall be A-shape coil (for down flow) incorporating draw-through air design for uniform air distribution. The coil shall be constructed of rifled bore copper tubes and louvered aluminum fins, with the frame and drip tray fabricated from heavy gauge aluminum. All metal parts in contacts with condensate shall be the same material to prevent electrolytic corrosion. The drip trays shall ensure the collection of condensate and be accessible for cleaning.

1.9 Dehumidification:-

A specific dehumidification cycle (split-liquid) shall operate by reducing the operating surface temperature in a section of one of the refrigeration coils by means of a solenoid valve in the liquid line. Full airflow of the unit will be maintained at all times to ensure consistent air distribution to the conditioned space.

1.10 Remote Air Cooled Condenser:-

The air cooled condenser shall be the low profile, weatherproof type incorporating high efficiency, direct drive, external rotor motors with axial blade fans. The condenser shall be constructed from heavy-duty aluminums and corrosion resistant components. Heavy duty mounting legs and all assembly hardware shall be included. Condensers shall be suitable for 24-hour operation and be capable of providing vertical or horizontal discharge. The condenser shall be fully factory wired and require a 230-volt I phase 50 hz electrical service.

1.11 Fan Speed Control Condenser:-

The condenser fans shall be directly driven by 4 pole, 230 volt, 50 hz electric motors with an IP55 enclosure rating and class F insulation. The motor shall be equipped with permanently sealed ball bearing and high temperature grease. The motors shall be speed controlled to ensure stable operating conditions from -5oC to 45 oC ambient by a factory fitted, direct acting pressure actuated fan speed controller. The control system shall be complete with input isolation switch, transducers and pressure switches.

The high performance heat exchanger shall include mechanically expanded crosshatched copper tubes and louvered aluminum form maximum heat transfer. The coil shall be finished in a high temperature modified epoxy coating to offer increased protection in aggressive environments. the coil shall be have maximum of 3 rows and adequate fins per meter and the face velocity shall not be more than 500 FPM.

1.12 Unit Size:-

The maximum footprint area of the unit shall not exceed 1.5 m² . The unit shall require front access (600 mm) only for routine service and installation work.

1.13 Unit Controller:-

The unit controller shall be microprocessor based and include a large .LCD backlit graphic display for clear visibility of text and graphics. The display and control buttons shall be accessible from the unit front without removing any external panels. The controller shall feature ISP (In-system- Programming) technology to support program upload via a PC.

Control strategies shall be P-I-D with dew point compensation for accurate temperature and humidity control. A selection of return or supply air control shall be provided to suit the application. The controller shall have a user friendly menu driven interface with supporting help screens and shall use multi protocol data communications. Access to the controller settings to prevent against unauthorized access. In normal operating mode screen shall display unit number, temperature and relative humidity set points and actuals, graphs, time, date and operating status. Dynamic icons identify the systemoperating mode. A 48-hour real time log of temperature and humidity data shall be retained by the control system. All parameters and data shall be protected in memory by an onboard battery. An EIA- 232 communications interface shall provide the capability of remote monitoring with the option of EIA-485 interface on 2 or 4 wire connection.

1.14 Control:-

The control system shall allow programming of the following conditions:

- Temperature set point
- Humidity Set point
- High Temperature Alarm
- Low temperature Alarm
- High Humidity Alarm
- Low Humidity Alarm

The control system shall include the following settable features:

- Unit identification number.
- Startup Delay, Cold start Delay and Fan Run on timers
- Sensor Calibration.
- Remote shutdown & general Alarm management
- Compressor Sequencing.
- Return temperature control.
- Choice of Modulating output types.

1.15 Alarms:-

The microprocessor shall activate an audible, visual and general alarm in the event of any of the following conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- Loss of Air
- High Pressure
- Low Pressure
- Humidifier Low Water
- Water Under Floor
- Spare Alarm 1 and 2 (Customized text)

The unit shall also incorporate the following protections:

- Single phasing preventors.
- Reverse phasing
- Phase imbalancing
- Phase failure

Overload tripping (MPCB) of all components

KITCHEN AHU WITH ACTIVATED CARBON FILTER

AHU SECTION

The ductable unit shall be ceiling mounted type. The housing/casing of the air handling unit shall be double skin construction. The framework shall be of extruded aluminium hollow sections. The entire frame shall be assembled using pressure die cast aluminium joints to make a sturdy, strong & self supporting frame work for various sections.

25mm thick double skin panels shall be made of 0.63 mm pre-plasticised GSS sheet on outside and 0.63 mm galvanized sheet inside with P.U. insulation injected in between. These panels shall be screwed on to the framework with soft rubber gasket on aluminium frame to make the joints air tight. Insulation material shall be of 38 Kg./m³ density minimum. Detachable steel drain pan with necessary slope to facilitate fast removal of condensate shall be provided. Necessary outlet from the drain pan shall be provided. The unit shall be suitably insulated from inside to avoid condensation on outer surface. Necessary provision for ceiling suspension shall be provided.

FAN AND MOTOR

The fan shall be DIDW centrifugal backward curved fan having three phase motor as specified. The fan shall be in 100% galvanized construction and shall be statically and dynamically balanced.

The fan motor shall be three phase squirrel cage suitable for 415 +/-10% V Ac supply fan and motor shall be belt driven.

COIL

The chilled water coil shall be of seamless copper tubes not less than 0.5 mm thick and 12mm OD. Coil face areas shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 150 meters per minute. The coil shall be pitched in the unit casing for proper drainage. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of airflow.

The fins shall be uniformly bonded to the tubes by mechanical expansion of the tube for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 FPI & shall be 0.17 to 0.2 mm thick. The coils shall be tested against leaks at a hydraulic pressure of 21 kg/sqcm. This pressure shall be maintained for period of 2 hours. No drop should be observed indicating any leaks. The water headers shall be completed with water in /out connections, vent plug on top and drain at bottom and designed to provide water velocity between 2 to 6 FPS. The coils exceeding 6 rows depth should be in two equal parts.

ELECTROSTATIC SECTION

Made of 16 gauge galvanized sheet, High bake epoxy powder coated, Washable type

aluminum mesh pre-filter, Washable type aluminum mesh post filter, Stainless steel spiked ionizers to create high voltage DC field, aluminum collector plates which should be alternatively charged positive & negative with large collecting area with 14" deep cell, to work as magnet for charged smoke & oil particles. The system should be fitted with adsorber module having activated carbon granules of minimum thickness of 18mm, which can be accommodated inside the ESP Section, with slide in and slide out facility.

Average efficiency of 90-95% in single pass as per DOP test method. Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 micron through solid state power supply. Collector cell should be of permanent type and slide out facility for easy removal for cleaning. Operating Voltage: 220V/1Ph/ 50Hz, Power consumption: 50 watts per unit/module upto 7500 cfm. Ionizing Voltage: 12.5 – 13.0 kVDC, Collector Cell Voltage: 6.0 – 6.5 kVDC, System should be fitted with interlock switch for safety; the system should be able connected to a fan section to achieve airflow of 500 FPM across the air cleaner.

The filter should have a constant pressure drop.

FAN COIL UNITS

1. General

The fan coil units shall be complete in all respects and shall generally comply with the specifications as given hereunder.

2. Fan Coil Units

2.1 The fan coil units shall be ceiling suspended horizontal /vertical type complete with finned coil, fan section with motor, drain pans, air filters, filter box, fan speed regulator and other controls.

2.2 Cooling Coil

The coil shall be of seamless copper tubes not less than 9 mm O.D. 0.41 mm thick and shall have continuous aluminium plate fins. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The coil circuit should be sized for adequate water velocity but not exceeding 1.8 M/s (6 F.P.S) the air velocity across coil shall not exceed 500 FPM or 155 MPM the fins shall be uniformly bonded to the tubes by hydraulic expansion of the tubes.

The coils shall be tested against leaks at a hydraulic pressure of 10 kg/sq.cm. This pressure shall be maintained for a period of 2 hours. No drop should be observed indicating any leaks.

2.3 Fan Section

2.3.1 This shall consist of (2) two light weight aluminium impellers of forward curved type, both statically and dynamically balanced, along with properly designed G.I. sheet casings.

2.3.2 The two impellers shall be directly mounted on to a double shaft, single phase multiple winding motor capable of running at (3) three speeds.

2.4 Drain pans

2.4.1 The drain pan shall be of double skin construction made of 1.00 mm stainless steel (AISI 304) covering the whole of coil section and extended on one side for accommodating coil connection, valve etc and complete with a 25 mm drain connection. The drain pan shall be insulated with 25 mm expanded polystyrene and covered with second G.I. tray.

2.5 Filter Plenum (Horizontal Type)

- 2.5.1 The Plenum shall be part of unit ceiling housing the fans and the coils.
- 2.5.2 Each unit will have a 15 MM thick washable air Filter made of Nylon mesh filter media in an aluminium frame with 85% efficiency down to 20 micron.

3. **FCU casing**

The Vertical type fan coil units will be provided with plastic cover with a steel casing to house the coil, filter and have space for piping & controls.

4. **Speed Control**

A sturdy switch shall be provided with the unit complete with wiring, for off and with minimum (3) three speed control, of the fan.

5. **Painting**

The fan coil units should be powder coated in suitable colors.

6. **Automatic Controls**

- 6.1 Each unit shall have a room type thermostat and a 2 way motorized water valve. The valve shall be fixed at a convenient location. The thermostat shall have pre-calibrated thermistor sensors for operation of room temperature between 15⁰C – 35⁰C with a switching differential of 1⁰C. The thermostat shall be suitable for heat cool modes. Thermostat shall have a provision for “temperature set point reset” facility for occupied and unoccupied functions. The thermostat shall be mounted along with the speed control switch on a common plate. The plate shall clearly indicate the fan positions. The controls should be as per specifications under ‘controls’.
- 6.2 The water valves on inlet line shall be of gun metal ball type with integral water strainers, having BSP(FPT) inlet and flare type mpt outlet connection. The valve on return line shall be as above, but without the water strainer.

7. **Water Connections**

The water lines shall be finally connected to the coil of the fan coil unit, by at least 300 mm long, type 1 seamless solid drawn copper tubing with flare fittings and connections.

HEATING SYSTEM

1. General:

The electric heating system and hot water heating system shall comply with the specifications as laid down.

Hot Water Generator

- 1.1 Hot water generator shall be the electric water heater consisting of a vertical tubular shell, closed to both the ends with bolted end covers. The shell shall be fabricated from M.S. sheet of thickness not less than 10 mm and joints shall be welded. It shall be mounted on a rigid chain iron tripod stand. A drain shall be provided at the lower end and inlet and outlet connections with flanges shall be on upper end lower side. Connections for safety valve and controls shall be provided on the top. A required no. of sockets for heater elements shall be provided. The construction shall conform to the Indian standards/international standards. It shall be designed for a working pressure of 21 Kg/cm² and tested accordingly.
- 1.2 Sheathed tubular electric resistance type heater elements shall be used and connected for equal loading.
- 1.3 The heater shall be connected in a manner to provide capacity control as under:

Upto 100 KW	- 2 Steps
101 KW to 300 KW	- 3 Steps
301 KW to 600 KW	- 4 Steps

Upto 2 sets, a remote bulb 2 step thermostat shall be used in conjunction with contactors of same size and fire 3 or more steps. A modulating type thermostat, modulation motor and step controller shall be used.
- 1.4 The electric water heater shall be equipped with a safety thermostat to cut off the power in case the temperature of water exceeds the normal limits. A safety valve shall be provided on the top of the heater and the outlet of the same be piped out of the plant room. The drain shall be connected to the nearest drain point. Stem type thermometer & pressure gauge at inlet & outlet of the boiler shall be provided.
- 1.5 The electric heater shall be insulated with 50 mm thick resin bonded fibre glass or equivalent material. The thermal conductivity of the insulating material shall not exceed 0.03 Kcal. per m/hr. at 10 deg. C mean temperature and density shall not be less than 24 Kg/Cum for fibre glass and 48 Kg/Cum for mineral wool. The insulation shall be clad with 1 mm thick aluminium sheet.
- 1.6 The electric hot water heater shall be installed as per the manufacturer's instruction and as shown on drawings.

PAN TYPE HUMIDIFIER

Type:

The pan type humidifier shall be closed type and connected to the supply air duct for introduction of steam when required.

Construction

The body of the humidifier shall be fabricated out of stainless steel sheet at least 2mm thick with all joints welded with stainless steel welding rods and all edges rounded off. The pan shall be made completely air tight and leak proof. On top of the pan an openable cover shall be provided for maintenance of internal components.

The humidifier shall be externally insulated with Resin bonded fibreglass of density not less than 32 Kg/cub.m and then cladded with 0.8 mm thick aluminium sheet.

The humidifier shall have two chambers with two banks of heaters. One bank of heaters shall always remain ON when the AHU is in operation to maintain the temperature of water between 60 - 70 deg. C and the other bank should come on when there is signal from the humidistat for humidification.

The electric heaters shall be submersible type made out of incoloy sheeth and brass/bronze flanges. The heaters shall be of suitable rating to produce instant steam when required.

Electrical panel (For Hot Water Generator/Boiler and Pan type Humidifier)

The electrical panel box shall be made of 16 GCRC sheet and painted with heat and water resistant paint. All switchgears and internal components of the panel shall be of L&T/ Seimens / EE make only.

Controls and accessories:

The humidifier shall be complete with following controls and accessories:

- a. Water proof light in the tank
- b. Water level indicator
- c. Low water level cutoff switch
- d. Float valve with bronze ball
- e. Make up , quick fill and drain connections
- f. Safety thermostats.
- g. Fault indication lamp.

WATER CIRCULATION EQUIPMENTS

A COOLING TOWERS

SCOPE

This chapter covers the general requirements of cooling towers for packaged units, central air-conditioning plants and cold rooms.

TYPE

The cooling tower shall be of Mechanical draft type. Fan on Mechanical draft towers may be on the inlet air side or exit air side. In case of former it is called forced draft type and in case of later it is called Induced draft type. On the basis of direction of air flow and water flow, Mechanical draft cooling tower can be counter flow or cross flow type as per the manufacturer design. This may be of any of the following construction as may be specified in the tender specifications:-

- a) In wooden construction with wood or PVC fill and RCC basin.
- b) In fibre glass reinforced plastic (FRP) construction with PVC fill and FRP basin.
- c) In masonry construction.

The mechanical draft cooling towers of wooden construction and masonry construction, being un-common now, have been excluded from the scope of these specifications.

DESIGN

i) Rating:

The cooling tower shall be rated for the heat rejection capacity specified in the tender specifications. All cooling towers shall be certified by CTI (Cooling Tower Institute).

ii) Range:

The Cooling tower shall be designed to cool the requisite quantity of water through 4.2 degree C or as specified in the tender specifications, against the prevailing wet bulb temperature.

iii) Wet Bulb approach:

The cooling tower shall be selected for a wet bulb approach of not more than 2.77 degree C.

iv) Outlet temperature:

The cold water temperature from the cooling tower shall match the entering temperature for which the condenser selection is made.

v) Flow rate:

The water flow rate through the cooling tower shall match that through the condenser.

vi) Multi cell design:

The induced draft cooling tower shall be of one or more cells.

vii) Drive Motor: The fan motor shall be premium efficiency IE3 class, as per IS 12615.

MATERIAL AND CONSTRUCTION

Fibreglass Reinforced Plastic (FRP) cooling tower

i) The structural framework of the cooling tower including all members shall be designed for the load encountered during the normal operation of the cooling tower and its maintenance. The structure shall be rugged and rigid to prevent distortion and shall include tie arrangements as may be necessary.

ii) The cooling tower shall be induced draft type, with FRP casing in square/ rectangular/ octagonal/ circular shape, and with an FRP basin to match the shape of the casing.

iii) The air intake shall be from openings all along the circumference of the casing near its base in case of circular shape. Air Intake shall be along the sides in case of square or octagonal/ rectangular cooling tower. These openings shall be covered with hot dip galvanised expanded metal mesh screens.

iv) The basin shall have a holding capacity adequate for operation for at least 30 minutes without addition of make-up water to the basin. The construction should be such as to eliminate the danger of drawing air into the pump when operating with minimum water in the basin.

v) The basin fittings shall include the following: -

a) Bottom /side outlet,

b) Drain connection with valve,

c) Ball type automatic make-up connection with valve,

d) Overflow connection,

e) Bleed off with valve, from inlet header to overflow pipe.

vi) The supporting framework for the tower casing and the water basin shall be made of hot dip galvanised steel and it shall be further protected with epoxy painting.

vii) The filling shall be of PVC. Thickness of PVC fills shall not be less than 0.2mm. These shall be of such construction as to provide low air resistance, large wetted surface for a high heat transfer efficiency, and easy replace ability.

viii) The water distribution may be either through self-rotating or fixed type sprinklers or through balancing, sub balancing and spreader troughs (unpressurised system) “open gravity type with polypropylene nozzle”, ensuring uniform water loading and distribution of water over the fill. All pipes and fittings shall be of PVC. The sprinklers shall operate from the residual velocity head at the headers. Due care shall be taken with regard to corrosive effects and maintainability in the design of the water distribution system.

ix) Drift eliminators of PVC shall be provided for maximum removal of entrained water droplets. The spacers and tie rods used shall be of plastic material.

x) The fan shall be multi-blade axial flow type, made of aluminium alloy or FRP. The fan assembly shall be statically and dynamically balanced.

xi) The fan drive shall be from a three phase induction motor of efficiency class IE3 as per IS 12615, either direct or through a spiral gear work. The entire drive arrangement shall be designed for a minimum noise and it shall be rigidly supported to the tower structure.

xii) The motor starter shall be as following:-

The motor starter shall conform to IS: 1822 —Motor starters of voltage not exceeding 1000 volts and shall be air insulated and suitable for 415 volts, + 10%, 50 Hz., 3 phase AC supply. Enclosures shall have protection of IP 55 for outdoor applications.

Starter for the motor shall be direct on line (D.O.L) for motors up to and including 7.5 H.P. rating and automatic star-delta close transition type for motors of higher ratings unless otherwise specified in the BOQ. Starters shall be rated for continuous duty. Starting current should not exceed two times the full load current.

Each starter shall be provided with the following protections: -

a) Thermal overload on all the three phases with adjustable settings.

b) Under voltage protection.

c) Independent single phasing preventor. (Current sensing type)

Adequate number of extra NO/ NC contacts for interlocks, indicating lamps etc. shall be provided on the starter/ contactor.

xiii) To ensure safety of personnel at the time of working on cooling tower a steel ladder shall be provided in such a manner and location as necessary to give safe and complete access to all the parts of the cooling tower requiring inspection or adjustments. The ladder shall be bolted to the tower at the top and grouted in masonry at the bottom end.

INSTALLATION

The cooling tower shall be installed on M.S. girders fixed in masonry foundations with cement concrete footing or as per manufacture standards. Second class brick work and

cement mortar having one part cement & six parts sand shall be used for the masonry work
12mm sand cement plaster shall be provided over the brickwork.

These may be located at a well-ventilated place either at ground level and contiguous to the plant room, or on the terrace of the building in consultation with the Architect. In case the cooling towers are located on the terrace of the building, the structural loading of the terrace shall be considered. For this respective columns are to be raised by two feet at the terrace. Cooling towers shall be installed in such a way that their load is transferred directly to the columns for which necessary Mild steel-I sections shall be provided by the air-conditioning contractor. The cooling towers shall be rested on Mild Steel-I sections & not on terrace slab. Sufficient free space shall be left all around for efficient operation of the cooling tower.

Cooling tower shall be not less than 75cm above the ground/ floor level unless otherwise stated in the tender specifications. 6mm neoprene pads shall be placed between the tower and the girder for vibration isolation whereas directed by the Engineer-in-charge. Guy-wires of suitable sized shall be used to secure firmly to its base wherever necessary.

PAINTING

The cooling towers shall be supplied with the manufacturer's standard finish painting.

B SPLIT CASING PUMPS

The centrifugal pumps shall be used for chilled water re-circulation in the air conditioning system. The pump shall be back pull out top discharge split casing type as per the requirements given in the schedule of equipments and bill of quantities. The capacity of the driving motor shall be at least 25% in excess of the BHP requirement of the pump.

1.1 Construction.

The split casing pumps shall conform to ISI 1520 and the construction of the pumps shall be as follows.

S.NO.	DESCRIPTION OF COMPONENT	MATERIAL / TYPE OF CONSTRUCTION
1.	Pump Casing	Close grained cast iron of heavy section, end suction back pull out type and machined to close tolerance.
2.	Impellar	Bronze/Gunmetal machined to close tolerance.
3.	Pump Shaft	High quality alloysteel EN8 grade.
4.	Pump Bearings	Heavy duty/ball/roller/ journal bearings.
5.	Shaft sleeves	Gun metal.
6.	Base frame	Cast iron/fabricated out of MS channel in all welded construction.
7.	Flanges	As per ISI standards.
8.	Stuffing box	Mechanical seal.
9.	Pump coupling	Flexible steel pin and rubber bushing type protected by guard.

1.2 CONSTRUCTION DETAILS.

The pump casing shall be end suction vertical back pull out type and the pump shall be installed such that the internal parts of the pump like impeller, mechanical seal and bearing etc can be serviced without disconnecting the pipes or disturbing the motor and pump alignment. The joining faces of the pump casing shall be machined and ground to smooth finish and sealed with leak proof gasket. The suction passages of the pump shall be volute in form thereby allowing smooth entry of water to the impeller. The impeller shall be double suction, enclosed type, statically and dynamically balanced. The impeller water passages shall be smoothly finished to ensure minimum friction loss and maximum efficiency. The pump shall be supported by two precision bearings grease or oil lubricated. The pump casing and the internal components shall be designed to withstand the discharge pressure plus the static water head + additional 50% of the total pressure.

1.3 Pumps for Variable Speed Drive

1.3.1 The pumps for variable Speed Drive should be similar to the Vertical Split Casing given above.

1.3.2 However, the pump selected for variable speed drive shall be capable of performing satisfactorily over a wide range of speed, allowing a speed variation between 30% to 100%.

1.3.3 The pump motor shall be controlled by Variable Frequency Drive (VFD), instead of standard starters.

2. Variable Frequency Drive (VFD)

2.1 The variable frequency drive shall be micro-processor controlled design complete with a controller suitable for automatic control of operation based on an external signal from sensor or BMS.

2.2 Each pump shall have an independent VFD.

2.3 However, the Microprocessor based controller shall be common for each set of pumps in a particular application.

2.4 The drive shall have a key pad control and a LED display module, alongwith a manual ON/OFF and bypass switch.

2.5 The drive shall have a diode bridge rectifier to convert 3-phase AC to fixed DC voltage power factor shall remain above 0.98.

2.6 The drive shall be capable of displaying the following information, such as, frequency, voltage, current, KWH, percent torque, percent power RPM etc.

3.0 PUMP ACCESSORIES.

The following accessories and fixture will be provided with each pump along with

other standard accessories.

- a. Air vent valves.
- b. Drain Plug.
- c. Seal Connections.
- d. Lubrication fixture & mechanical seal.
- e. Suction & delivery shut off valves.
- f. Non return valve.
- g. Water pressure gauges on inlet and outlet pipes. (Included in pumps)
- h. Y-type strainer on suction pipe.

4.0 PUMP MOTOR & STARTER

The driving motor shall be totally enclosed fan cooled type with class 'B' insulation. The motor shall be designed for quiet operation and its speed shall not exceed 1450 RPM. The motor starter shall be star-delta type. The starter shall have thermal overload on all the 3 phases and single phase preventor. The starter shall have spare NO/NC contacts for interlocking and indication lamps.

5.0 INSTALLATION OF PUMPS.

The installation of pumps shall be carried out by the contractor as per the manufacturer's - recommendations.

The pumps shall be installed on concrete foundations with at least 25mm thick vibration isolation pads or any other vibrating isolation fittings. The pump and the motor shall be installed on a common steel frame and properly aligned. The alignment of the pump and the motor and the base plate level shall be checked at site and the result submitted to the Engineer in charge. As far as possible the pumps sets shall be factory aligned and if site alignment is necessary it shall be done by experienced and trained personnel. The pumps shall be installed in a manner that the maintenance can be done conveniently. The chilled water circulation pumps shall be insulated in a manner specified under section 'Insulation'. The insulation shall be done in such a manner that maintenance can be done on the pumps without causing damage to the insulation.

6.0 TESTING

The contractor shall submit the manufacturer's performance curves for the pumps supplied by him. Tests shall be conducted on each pump set after completion of the installation to check and confirm the delivery load, water flow rate and the BHP. The test results shall correspond to the performance curves. The pumps performance shall be computed from the manufacturer's pump curves.

All equipment instruments and labour required for testing shall be furnished by the contractor at no extra cost.

7.0 PAINTING

The pumps along with the base, motor and accessories shall be painted with two coats of synthetic enamel paint of approved colour after testing and commissioning.

C EXPANSION TANK

Unless mentioned otherwise, an expansion tank of PVC double layered (Sintex or equivalent) , contain twice the maximum expansion likely to place in the system, shall be provided. The bottom of the tank shall be at least 600mm above the highest point of the system. Tank shall be insulated, if required and be complete with float valve, gauge glass, drain, overflow and make up connections, with gate valves and vent piping as required.

VENTILATION FANS

1.0 Codes and Standards:-

The design, materials, construction, manufacture, inspection, testing and field performance of the centrifugal fans shall comply with all currently applicable international / national codes / safety regulations. In particular the equipment shall conform to latest editions of all applicable codes and standards listed below.

AMCA-201 - Fans and systems - Application guide

AMCA-203 - Field performance measurement of fan systems

AMCA-210 - Laboratory Methods of testing Fans for Aerodynamic performance rating.

AMCA-2404 - Drive arrangements for centrifugal fans

2.0 Centrifugal Fans:-

2.1 Design Requirements:-

The design parameters for the centrifugal fans shall be as below.

2.2 Design and Constructional Features:-

a. General

a.i Centrifugal fans shall be DIDW / SISW in simply supported arrangement (i.e. Bearings on both the sides) construction complete with access door, squirrel cage induction motor, outlet damper, base frame, canvass connection, V belt drive set, belt guard, foundation bolts, nuts, slide rail and vibration isolators. Direction of discharge / rotation and motor position shall be as per the good for construction shop drawings. All centrifugal ventilation fans shall be AMCA (Air Movement and Control Associates Incorporation of USA) certified for air performance & sound. Critical speed of the fan shall be minimum 125 % higher than the operating speed. Centrifugal Exhaust fans / motor and other accessories for toilet exhaust system shall be suitable for outdoor applications.

a.ii The Fans shall be AMCA Certified and performance certificate for the particular model of fans being supplied shall be submitted by the contractor.

b. Housing:-

b.i Housing shall be of welded construction, fabricated from carbon steel material with suitable reinforcement for rigidity. It shall be rigidly reinforced and supported by structural angles. Split casings shall be provided for large size fans, however neoprene packing shall be provided through split joints to make it airtight. Cut-off shall be designed to give smooth and quiet airflow from the outlet. Fan housing shall be of welded construction and provided with flanges at outlet for duct connection. Thickness of casing shall be as per manufacturer's standard & factory practices.

b.ii The distance between blade tips and cut-off shall be optimally fixed to reduce pressure pulsation. Inlet and outlet shall be flanged.

b.iii Housing shall be provided with standard clean out door with handles and neoprene

gasket.

b.iv Inlet cone shall be spun to have deep smooth contour. Close tolerance shall be maintained between inlet edge and the impeller shroud. Inlet cone profile shall ensure a smooth flow of air to blades. Inlet screens shall be provided for open inlet fans. Inlet guards shall be of 18 gauge galvanized wire mesh with 5 mm sieves. Inlet guards shall allow access for lubrication as required.

c. Impeller (Rotor):-

c.i The impeller shall be backward curve or aerofoil sectioned blades of non – over loading type. The Impeller blades shall be welded to back plate/center and shroud all along the length. Shroud shall be spun to have a smooth contour. Shaft sleeves shall be furnished as required. The impeller, pulley, and shaft sleeves shall be positively secured to the shaft. The locking device shall be designed to take the full torque due to momentum of impeller when the shaft suddenly gets arrested while running at operating speed. Air passages shall be free of interference.

c.ii Maximum operating speed of the fans shall be selected to maintain the fan outlet velocity of 2000 FPM (10.15m/s) and Noise level shall not exceed 75 db(A) at 1 mt. Distance from the equipment. The impeller along with driven pulley shall be balanced statically and dynamically after assembly. Balancing shall conform to minimum G 2.5 grade (as per ISO-1940) or Superior grade.

d. Shaft:-

d.i Shaft shall be properly sized for single piece hollow or solid construction of hot rolled steel and it shall be turned, ground and polished. Fan shaft shall not pass through its first critical speed at rated speed.

d.ii Fan shaft shall be of EN8, SAE-1040, SAE-1035 or equivalent .

e. Bearings:-

Fans shall be equipped with amply sized taper roller or ball or spherical roller anti friction or self aligning pillow block type bearings with integral dust and grease seals. Bearings shall be charged with grease. The grease capacity of the bearings shall be such that the fans are suitable for continuous operation for at least 12 months before re-greasing is required. Bearings shall be selected for a life of 50,000 hours and same shall be as per IS-3824. Grease fittings shall be 6mm button head type.

f. Drive Motor:-

The fan motor, suitable for the centrifugal fan drive shall be supplied by the contractor and the same shall be as per the specification. Motors shall be designed for continuous duty operation and shall have high efficiency. Drive motor shall have minimum 20 % margin over the fan limit load horse power. Motor shall be designed especially for quiet operation and motor speed shall not exceed 1440 rpm. The same shall be capable of accelerating to the rated rpm within safe stall time. The contractor shall submit the motor and fan torque characteristic curves along with other details for fan and motor in support of the selection.

The fan and motor combination selected for particular required performance shall be of most efficient and shall be for quiet running characteristics and high efficiency. Fan motor selected shall be in such a way that sound level is lowest (max. 75 db) while running. The power and efficiency factor for all motors shall be submitted along with offer. Motor shall be capable of running continuously with a 5 % drop in rated phase to phase voltage at 15 % increase in design power. Motor of 0.75 KW and over shall be fitted with integral positive temperature coefficient thermistors selected to afford class 1 protection. Motors below 0.75 KW shall be fitted with inherent over heat protection. The Motors shall be TEFC type with IP-55 Protection & Class 'F' Insulation. Motors shall be designed for 415 V +/- 10% & 50 HZ +/- 3 %.

g. Drives:-

Fans may be direct or belt driven. In case of belt driven fans, there shall be a minimum number of two belts per drive. All belt driven fans shall be equipped with fully enclosed belt guards with speed measurement openings and shall be easily removable. Belts shall be of oil resistant type. Belt guards shall not impede the airflow to the fan inlet. All belts shall be selected based on a service factor of 1.5 as applied to the drive motor kW rating. Should one belt fail the remaining belt(s) should be capable of carrying the full load. All belts shall be sized for 150% rated horsepower. The minimum number of belts to be provided will be as follows:

In case of direct drive, a hypoid gear coupling or flexible coupling of standard design shall be used. Pulleys shall be selected to provide the required speed. They shall be multi-groove type, with section and grooves selected to transmit 33% more load than the required power and shall be statically balanced. The belt guards shall be of M.S. sheet with angle iron reinforcements and 18 gauge expanded metal screen

2.3 Accessories:-

a. Common Base Frame:-

Mounting skid of structural steel shall be provided for supporting the fan & motor base frames. Mounting skid shall be bolted / welded with the embedded plates provided on the floor. Fans shall be fixed on mounting skid with vibrations isolators mounted in between.

b. Access Door and Drain Connection:-

Access door shall be provided for periodic inspection or cleaning. The door can be either toggle clamp fixed or as per manufacturer's standard design. Drain point with plugs or valves shall be provided if specified.

c. Outlet Damper:-

Fan shall be provided with a damper at outlet. Dampers at outlet of centrifugal fan shall be manually operated multi-louvered type with neoprene edging on blades for tight shut off. Each blade shall be provided with bronze/gun metal bearing at each end of spindle. Operating lever along with the necessary linkage shall be provided at an accessible position for operating the dampers. Suitable fixing device for locking the damper at desired position should be provided.

d. Flexible Connection:-

Flexible connections shall be provided on the suction / discharge ends of the fan as specified. The flexible connection shall be of heavy gauge double canvas / Neoprene impregnated glass fiber of length not less than 150mm.

e. Nuts & Bolts:-

All bolts, nuts & locknuts shall conform to IS: 1367. Self-tapping screws shall not be used.

2.4 NOISE & VIBRATION:-

a. The vibrations measured at bearings in both radial and axial direction shall not exceed the specified range in the "Good to very good region" of general machinery vibration chart of VDI-2056. The vendor shall furnish along with their offer the overall fan sound power level for each fan and motor operating at the duty conditions.

b. Vibration isolators of proven design for specified isolation efficiency shall be provided. Double deflection rubber in U shear or cushy foot vibration isolator or spring type isolators shall be provided for each fan. Rubber bushes, washers, wherever needed for the vibration isolators shall be included in the supply. Sufficient number of such isolators shall be provided to ensure isolation of foundation from vibration of the equipment. At the commissioning stage the vibration amplitudes shall be measured to ensure that the vibrations are within the permissible limit of 30 microns. Generally fans / motors shall be selected to run at very minimum vibration level in accordance with the standards and the fans which are to be mounted on the terrace floor should be selected in such a way that it will not transmit any vibration and sound to the office floors below.

2.5 Painting:-

Fans shall be painted on exterior and interior with two coats of red – oxide zinc chrome primer confirming to IS: 2074 or superior, over which 2 coats of synthetic enamel of approved shade shall be applied on all surfaces. Centrifugal fans / accessories which are to be installed on the terrace floor shall be suitably painted on exterior and interior surface to avoid corrosion, these fans / accessories are to be specially treated to take care of the adverse weather condition.

2.6 Accessories

All necessary accessories shall be provided for proper operation and shall also include (As part of Unit Price).

- a. Dunlop cushy foot vibration isolators for the blowers.
- b. Double canvass connections at the outlet of each fan.
- c. Nuts, bolts, shims etc. as required for the grouting of the equipment.
- d. Slide rails for mounting the motor and belt adjustments.
- e. 18 gauge galvanized wire mesh bird screens in the Inlet.
- f. Outlet damper.

3.0 Axial Flow Fan:-

All fans shall be AMCA (Air Movement and Control Associates Incorporation of USA) certified for air performance & sound.

a. Impeller:

The impeller shall be of die cast aluminium alloy with integrally cast aerofoil sectioned blades and hub. Impeller shall be fixed to motor shaft by a thrust plate and bolt reverse to direction of rotation, in addition to key lock. The critical speed of impeller shall be minimum 1.5 times of the operating speed. The impeller shall be statically and dynamically balanced to G 2.5 grade as per ISO: 1940.

b. Casing:-

Casing shall be of 2mm thick MS for impeller dia up to 600mm and 2.5mm thick MS for impeller dia above 600mm or as per manufacturer's standard and factory practices. Casing shall have flanged connection on both ends for ducted application. It shall be provided with suitable supports. Access door shall be provided in the casing for easy access to motor and impeller. Suitable arrangement for mounting of motor shall be provided.

c. Guide Vanes:-

In case of vane axial fans guide vane shall be provided on the discharge side.

d. Guards:-

Suitably designed guards shall be supplied.

e. Drive Motor:-

Motor shall be of totally enclosed fan cooled type squirrel cage induction of IP-55 protection and class-F insulation suitable to run on 415+/-10% Volts, 50+/-3% Cycles, 3-phase AC power supply. Motor conduit box shall be mounted on exterior of fan casing, and lead wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit. Fan motor shall be selected in such a way that sound level is lowest (max. 75 db at 3 m distance) while running. The motor shall be rated for continuous duty. The power and efficiency factor for all motors shall be submitted along with the offer. Motors shall be capable of running continuously with 5 % drop in rated phase to phase voltage at 15 % increase in design power. Motors shall be fitted with inherent over heat protection.

f. Speed:-

The speed of the fan shall not exceed 960 RPM for fan with impeller diameter above 1000 mm and 1440 RPM for fan with impeller diameter 1000 mm and less.

g. Painting:-

Fans and accessories shall be painted with two coats of red-oxide primer zinc chrome primer conforming to IS: 2074 or superior, over which two coats of synthetic enamel of approved shade shall be applied.

4.0 Propeller Fan:-

Propeller fans shall be direct driven, three or four blade type, mounted on a steel mounting plate with orifice ring. The blades shall be of steel and designed such as to give maximum volume at minimum noise level for minimum power consumption. The impellor shall be directly coupled to a purpose designated motor for efficient operation. Fan / motor shall be suitable for continuous duty and shall perform satisfactorily in ambient temperature of above 50 deg. C. The contractor shall furnish along with their offer the overall fan sound power level for each fan and motor operating at the duty conditions.

a. Mounting Plate:

Mounting plate shall be of steel construction, square with stream lined venturi inlet (reversed for supply applications) coated with backed enamel paint. Mounted plate shall be of standard size, constructed of 12 to 16 gauge sheet depending up on the fan size. Orifice ring shall be correctly formed by spinning or stamping to provide easy passage of air without turbulence and to direct the air stream.

b. Fan Blades:-

Fan blades shall be constructed of mild steel. Fan hub shall be of heavy welded steel construction with blades to the hub. Fan blades and hub assembly shall be statically and dynamically balanced at the manufacturer's works. Impellor hubs and blades, fan supports, wire guards and internal surfaces of fan chambers shall have smooth finish.

c. Shaft:-

Shaft shall be of steel, accurately ground and shall be of ample size for the load transmitted and shall not pass through first critical speed through the full range of specified fan speeds.

d. Motor:-

Motor shall be standard (easily replaceable) permanent split capacitor or shaded pole for small sizes, totally enclosed with pre – lubricated sleeve or ball bearings, designed for quiet operation with a maximum speed of 1000 rpm for fans 38 cm dia or larger and 1440 rpm for fans 30 cm dia and smaller. Motor for larger fans shall be suitable for 415 +/- 10% volts, 50 cycles +/- 3%, 3 phase power supply and smaller fans shall be suitable for 220V +/-10%, 50 cycles +/- 3 % single phase power supply. Motors shall be suitable for either horizontal or vertical services as indicated on drawings / Schedule of quantities. Motor selected shall fully comply with the specifications mentioned elsewhere. Fan / Motor selection shall be for continuous and quiet operation and the measured noise level shall not exceed 50 db (A) at 1 meter distance from the equipments. Motors shall be TEFC type with IP-55 protection & class 'F' Insulation.

e. Accessories:-

The following accessories may be required and provided with propeller fans, as indicated in Schedule of quantities.

Wire guard on inlet side and bird screen at the outlet.

Fixed louvers built in to a steel frame.

Regulators for controlling fan speed for single phase fan motors.

5.0 Inline Fans:-

a. Inline fans shall be complete with centrifugal impeller, casing, direct driven motor, vibration isolators, direction of discharge and rotation position shall be as per the job requirement and shall be marked on the fan assembly.

b. Housing shall be constructed of hot rolled GSS sheet metal construction of suitable thickness. Housing metal parts shall be either spot-welded or screwed or mounted together with rivets. Indication showing rotation arrow and make, model number and duty conditions of the fan shall be available on the housing.

c. Casing shall be with wide hinged doors which open easily inspection doors with handle and neoprene gasket shall also provided. Casing shall have flanged connection on both ends for ducted applications. Casing shall be primed and finish coated with synthetic enamel paint. Extended grease leads for external lubrication shall be provided.

d. Fan wheel shall be forward curved type, statically and dynamically balanced.

e. The fan shall be provided with ball bearings can be used in any mounting position at maximum indicated temperature. The bearing lubricant shall be suitable for a minimum ambient temperature of minus 150C (admissible for a short time without reaching dew point at minus 300C). For applications at maximum indicated ambient temperature life expectancy shall be 40000 hours minimum.

f. Fan motor, fans shall be supplied with built-in-thermal contact (TK) at the critical high temperature point ("B" = 1300C. The thermal contact shall open and break the power supply to the fan.

g. Motor shall be squirrel cage, totally enclosed, fan cooled standard round frame, constant speed, continuous duty, single winding, suitable for single phase supply (220V +/- 10%, 50 Hz +/- 3%). Motor shall be specially designed for quiet operation and lead wires from the motor to be conduit box shall be protected from the air stream by enclosing in a flexible metal conduit.

h. Fans shall be direct driven type.

i. All fans are hot dipped galvanized.

j. The assembly of fan and motor shall be suspended from the ceiling by spring type vibration isolators.

6.0 Fire Rated Smoke Exhaust Axial Fan:

a. The fire rated smoke exhaust fans generally shall be as described above suitable for

250oC for minimum 2 hours.

b. The blades shall be of aluminum alloy fixed on an aluminium hub-flange assembly suitable for multiple blades which shall be adjustable when the fan is stationary.

c. The collar shall be constructed of rolled steel and joints welded. The flanges shall have suitable holes for fixing the fans, ducts etc. The collar and flanges shall be galvanized for protection.

d. The collar shall be long to cover fan and motor.

e. The fan shall be supplied with factory mounted TEFC motor suitable for 250oC for minimum 2 hours. The motor shall be foot mounted.

f. The fan shall be approved for 250oC for 2 hours by international / national authorized agency.

g. The speed of the fan shall not exceed 960 RPM for fan with impeller diameter above 1000 mm and 1440 RPM for fan with impeller diameter 1000 mm and less.

7.0 Fire Rated Centrifugal Fan:-

a. Fire rated centrifugal fan generally shall be as described above and may have varied construction features as required.

b. The fan shall be supplied with factory mounted TEFC motor suitable for 250oC for minimum 2 hours. The motor shall be foot mounted.

c. The fan shall be approved for 250oC for minimum 2 hours by International / National authorized agency.

8.0 Limitation:-

The air velocity limits shall be as below:-.

Velocity at blower outlet shall not exceed 12 M/S

Inlet Velocity shall be limited to 5.08 M/S (1000 FPM).

8.1 Life of Ventilation & Smoke Exhaust Fans:-

Ventilation & Smoke Exhaust Fans shall be capable of providing average service life of 25 years.

DRY TYPE SCRUBBER

Electrostatic Precipitation Based Dry Type Scrubber Unit:

Electrostatic Section:

Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 micron through solid state power supply

Manufacturer:

Type of Filters: Electronic Precipitator

Operating Voltage: 220V/1Ph/ 50Hz

Power consumption: 50 watts per module/unit upto 7500 cfm.
(+/- 10% Voltage Variation)

Construction: Made of 16 gauge galvanized sheet, High bake epoxy powder coated.

Pre Filter: Washable type aluminum mesh pre-filter

Post Filter: Washable type aluminum mesh.

Ionizer: Stainless steel spiked ionizers to create high voltage DC field.

Collector Plate: Aluminum collector plates which should be alternatively charged positive & negative with large collecting area. Collector cell should be of permanent type and slide out facility for easy removal for cleaning.

Average efficiency: 90-95% in single pass as per ASHRAE test method.

Pressure Drop across filters (mm of water): 7mm (ESP and pre filter section w/o activated carbon)(Clean/Dirty) 15mm (ESP section and pre filter section with activated carbon)

Kitchen Scrubber

1. **General**

The kitchen scrubber shall be complete in all respects and shall generally comply with the following specifications given below :

2. **Air Washers**

2.1 The scrubber shall be of 16G G.I. Sheet metal fan section, mixing box and SS-304 made spray section, filter section and eliminators.

2.2 **Enclosure/Housing**

2.2.1 Enclosure shall be made of powder coated 18 gauge GI sheet with riveted and soldered lap joints casing angles shall also be of 40mm x 40mm. Angle shall be riveted and soldered to the casing.

2.2.2 The front panels shall be easily open-able for servicing the fan sections. It should provide easy access to remove air filters for cleaning.

2.2.3 The opening for access doors and gaps between sections shall be provided with the neoprene rubber T-gaskets fixed in grooves in the extruded sections.

2.2.4 The panels shall be fixed to the frame work with self tapping stainless steel screws and both ends of the screw shall be provided with rubber caps.

2.2.5 The access door to fan section is to be provided with a switch to shut the fan when the door is open.

2.3 **Fan Section**

2.3.1 The impellers of the fan or fan shall be of GI sheets, double inlet forward curved centrifugal design, both statically and dynamically balanced. The fan housing shall be of sturdy construction made from 16G (1.6mm) GI sheet with smooth air inlets. The fan shall be mounted on properly aligned shaft and mounted on self aligning bearing blocks. The casing of the cab section shall be made of 16G (1.6mm) GI sheets suitably reinforced to provide rigidity. The frame work shall be either be folded GI sheets or of hot dipped galvanized iron.

2.4 **Spray Section**

2.4.1 Spray section and tank shall be fabricated from 18 G 304 A stainless steel sheets with bolted construction having suitable stiffeners.

2.4.2 The section shall be complete with SS 304 water distribution header having ports and sized for uniform and adequate water flow through perforated SS 304 pipes. The spray nozzles shall be of brass construction.

2.4.3 The tank shall be fitted 3/4" (20 MM) float valve of commercial grade brass.

2.4.4 The spray section shall have provision for fixing one or two sets of air filters as specified later.

2.5 **Water Sump**

2.5.1 The water sump below the spray section shall be of 3mm MS plate with welded joints. The tank shall be complete with makeup, overflow and drain connections. A float valve shall be provided for makeup water line. The tank shall be given 2 coats of corrosion resistance paint and final coat of black enamel paint.

2.6 **Drift Eliminators**

2.6.1 Drift eliminators shall be of PVC supported at the top and bottom fixed to the spray section by means of GI notched bars. Eliminators shall be a set of vertical plates with a series of bends and deflections to give large surface area on which water drops and dust shall be impinge. Eliminators shall be properly stiffened at the sides.

2.7 **Distribution Plate**

2.7.1 Distribution plate shall be GI 18G with sufficient number of circular opening uniformly spaced for even distribution of air for spray type air washer.

3. **Pumps**

3.1 The water distribution pumps shall be of heavy duty, vertical type mounted inside the tank. It shall be complete with adjustable bleed of arrangement to prevent concentration of undesirable salts.

4. **Grease Filter & Carbon filter**

4.1 The standard pre-filters shall be with 5 layers of SS-304 wire mesh, fixed in a 22 G GI frame with handles for ease of removal.

4.2 The above set of filters shall be fixed in filter frames made of 22 G.I. sheets, shaped to prevent air leakage. The filters shall be easily removable. The filter section may from part of the spray section or may be bolted separately to the spray section.

4.3 Carbon filter shall be installed to eliminate the particles in the smoke.

5. **Motors and Starters**

5.1 The motor for each blower, shall be totally enclosed, fan cooled, squirrel cage induction type and conform to specifications as given under section 3.

5.2 The starters shall be "direct on line" type up to 7.5 H.P. All larger starters shall be

of fully automatic star delta type.

- 5.3 The pumps shall be provided with single phase, self tripping starter of “North West” make.

6. **Miscellaneous**

Necessary accessories shall be provided wherever necessary for proper operation and shall also include.

- 6.1 PVC eliminator fixed to the spray section to avoid water spillage.
- 6.2 Necessary piping for water circulation.
- 6.3 Vibration isolators for the blowers and pumps.
- 6.4 Canvass connections at the outlet of each fan.
- 6.5 Nuts, bolts, shims etc., as required for the grouting of the equipment.
- 6.6 Float valve in the spray tank, along with quick fill connection.
- 6.7 Gate valves in drain; make up, quick fill line etc, as required.
- 6.8 Built in isolator switches for the fan and pump motor and wiring from the isolators up to the respective motors.

7. **Limitation**

- 7.1 The air velocity limits are as follows:-
 - 7.1.1 Velocity across scrubber not exceeding 2.54 M/s (500 FPM).
 - 7.1.2 Velocity at blower outlet-not exceeding 10.16 M/s (2000) FPM.

CONTROLS

1. SCOPE

This chapter covers the requirements of equipment safety controls, refrigerant flow controls and system controls.

AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 12.

ELECTRICAL WORKS

1. SCOPE

This chapter covers the requirements of equipment safety controls, refrigerant flow controls and system controls.

AS PER CPWD “GENERAL SPECIFICATIONS FOR HVAC WORKS 2017” CHAPTER 13.

DUCT WORK AND OUTLETS

1. General:

- 1.1 The work under this part shall consist of furnishing labour materials, equipment and appliances as specified necessary and required to install all sheet metal and other allied work to make the air conditioning supply, ventilating, exhaust system ready for operation as per drawings.
- 1.2 Except as otherwise specified all duct work and related items shall be in accordance with these specifications.
- 1.3 Duct work shall mean all ducts, casings, dampers, access doors, joints, stiffeners and hangers.

2 Duct materials

- 2.1 The ducts shall be fabricated from galvanized steel sheets class VIII GSS sheets (120 gm/sqm) conforming to IS:277-1962 (revised) or aluminium sheets conforming to IS:737-1955(with latest amendments) (wherever aluminium ducts are specified).
- 2.2 All duct work, sheet metal thickness and fabrication unless otherwise directed, shall strictly meet requirements, as described in IS: 655-1963 with amendment-i (1971 edition)

The thickness of the sheet shall be as follows: -

	size of duct	sheet thickness		type of joints	bracing if any
		GI	Aluminium		
2.2.1	Upto 750mm	0.63 mm	0.80 mm	GI flange	
2.2.2	751 mm to 1000 mm	0.80 mm	1.00 mm	25x25x3 mm Angle iron Frame With 8 mm dia.nuts & bolts.	25x25x3 mm at the rate of 1
2.2.3	1001 mm to 1500 mm	0.80 mm	1.00 mm	40x40x5 mm angle iron frame with 8 mm dia. Nuts & bolts.	40x40x3mm at the rate of 1
2.2.4	1501 mm to 2250 mm	1.00 mm	1.50 mm	50x50x5 mm angle iron to be cross braced	40x40x3mm at the rate of 1.2

- 2.2.5 2251 mm and above
- | | | | |
|---------|---------|---|--|
| 1.25 mm | 1.80 mm | 50x50x6 mm angle iron frame with 10 mm nuts & bolts at 125 mm centre. | diagonally with 10 mm dia nuts & bolts at 125 mm centre. |
| | | 40x40x3 mm at the rate of 1.6 | |
- 2.3 The gauges, joints and bracings for sheet metal duct work shall further conform with the provisions as shown on the drawings.
- 2.4 Ducts larger than 450 mm shall be cross broken, duct sections upto 1200 mm length may be used with bracing angles omitted.
- 2.5 Changes in section of duct work shall be affected by tapering the ducts with as long a taper as possible. All branches shall be taken off at not more than 45 deg. Angle from the axis of the main duct unless otherwise approved by the engineer-in-charge.
- 2.6 All ducts shall be supported from the ceiling/slab by means of fully threaded GI rods of 10-12 mm dia with m.s. angle at the bottom.

3. Installations

- 3.1 During the construction, the contractor shall temporarily close duct openings with sheet metal covers to prevent debris entering ducts and to maintain opening straight and square, as per direction of engineer-in-charge.
- 3.2 Great care should be taken ensure that the duct work does not extend outside and beyond height limits as noted on the drawings.
- 3.3 All duct work shall be of high quality approved galvanized sheet steel guaranteed not to crack or peel on bending or fabrication of ducts. all joints shall be tight and shall be made in the direction of air flow.

The ducts shall be re-inforced where necessary, and must be secured in place so as to avoid vibration of the duct on its support.

- 3.4 All air turns of 45 degrees or more shall include curved metal blades or vanes arranged so as to permit the air to make the abrupt turns without an appreciable turbulence. Turning vanes shall be securely fastened to prevent noise or vibration. All ducts shall be fabricated and installed in accordance with modern design practice. The sheet metal gauges and fabrication procedures as given in i.s.s specifications shall be adhered to and shall be considered as an integral part of these specifications.
- 3.5 The duct work shall be varied in shape and position to fit actual conditions at

building. All changes shall be in accordance with accepted airconditioning duct design and subject to the approval of the engineer-in-charge. The contractor shall verify all measurements at building and shall notify the engineer-in-charge of any difficulty in carrying out his work before fabrication.

- 3.6 Sponge rubber of approved equal gaskets shall be installed between duct flanges as well as between all connections of sheet metal ducts to walls, floor columns, heater casings and filter casings. sheet metal connections shall be made to walls and floors by means of galvanized steel angles anchored to the building structure with anchor bolts and with the sheet bolted to the angles. sheet metal connections shall be as shown in the drawings or as directed by engineer-in-charge.
- 3.7 The ducts shall be supported from the structure by means of suitable supports grouted in the r.c.c. work. The type of support should meet the approval of the engineer-in-charge and should involve minimum damage or breakage. In no case the duct will be rested upon the false ceiling/boxing or on supports grouted in the wall.
- 3.8 Flanges and supports are to be black, mild steel and are to be primer coated on all surfaces before erection and painted with aluminium thereafter accessories such as damper blades and access panels are to be of materials of appropriate thickness and the finish similar to the adjacent ducting as specified.
- 3.9 Joints, seams, sleeves, splitters, branches, takeoffs and supports are to be as per duct details as specified, or as decided by engineer-in-charge.
- 3.10 Joints requiring bolting or riveting may be fixed by hexagon nuts and bolts, stove bolts or buck bolts, rivets or closed centre top rivets or spot welding. Self tapping screws must not be used. all fixing must have a permanently non-corrosive finish such as cadmium plating or galvanizing as appropriate. Spot welds and bronze welds are to be coated on all surfaces with zinc rich paint, as approved by engineer-in-charge.
- 3.11 The flexible joints are to be fitted to the suction and delivery of all fans. The material is to be normally double heavy canvass or as directed by engineer-in-charge. On all circular spigots the flexible materials are to be screwed or clipband with adjustable screws or toggle fitting. For rectangular ducts the material is to be flanged and bolted with a backing flat or bolted to mating flange with backing flat.
- 3.12 The flexible joints are to be not less than 75 mm and not more than 250 mm between faces.
- 3.13 The duct work should be carried out in a manner and at such time as not to hinder or delay the work of the other agencies especially the boxing or false ceiling contractors.

4. **Dampers**

- 4.1 At the junction of each branch duct with main duct and split of main duct, volume

dampers must be provided. Dampers shall be two gauges heavier than gauge of the large duct, and shall be rigid in construction to the passage of air.

- 4.2 The volume dampers shall be of an approved type, lever operated and complete with locking devices which will permit the dampers to be adjusted and locked in any positions.
- 4.3 The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 mm (18) gauge, reinforced with 25 mm angles 3 mm thick along any unsupported side longer than 250 mm angles shall not interface with the operation of dampers, nor cause any turbulence.
- 4.4 Automatic and manual volume opposed blade dampers shall be complete with frames and bronze bearings as per drawings. Dampers and frames shall be constructed of 1.5 mm aluminium and blades shall not be over 225 mm wide. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8 mm thickness with fine mesh spacking.
- 4.5 Wherever required for system balancing, provide a volume balancing opposed blade damper with quadrant and thumb screw lock. Provide damper rod and damper block with upset screws.
- 4.6 After completion of the duct work, dampers are to be adjusted and set to deliver the required amounts of air as specified on the drawings.
- 4.7 **Motorised Combined Smoke & Fire dampers:**

The fire dampers shall be provided at all supply and return air ducts at AHU room crossings and at all floor crossings or wherever shown on the drawings. The fire & smoke dampers shall be of atleast 90 minutes fire rating certified by CBRI, Roorkee as per UL 555 : 1973. Fire damper blade & outer frame shall be formed of 1.6 mm galvanized sheet steel. The damper blade shall be in pivoted on both ends using chrome plated spindles in self lubricated bronze bushes. Stop seals will be provided on top & bottom of the damper housing made of 16 G galvanized sheet steel. For preventing smoke leakage side seals will be provided. In normal position damper blade shall be held in open position with the help of a 24 V operated electric actuators thereby providing maximum air passage without creating any noise or chatter. The damper shall be actuated through electric actuator. The actuator shall be energised with the help of a signal from smoke detector installed in AHU room. The fire damper shall also close due to temperature rise in SA ducts through the electric temperature sensor factory set at 165 deg F micro switches with bakelite base will be provided to stop fan motor and give open & close signal at remote panel in case of motorised actuator.

Each fire dampers shall have its own panel which will incorporate necessary circuit required to step down voltage available from power supply to shown status of the damper (open or close), to allow remote testing of damper & indication in event of damper closure due to signal from smoke sensor/ temperature sensor & reset button. Additional terminal will be provided to have signal (sound beep or visual) in Central Control Room

Damper actuator shall be spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. Spring return action of the actuator shall be an in built mechanism and not mount externally.

The fire damper shall be mounted in fire rated wall with a duct sleeve 600 mm long. The sleeve shall be factory fitted on fire damper. The joints at sleeve end shall be slip on type. Minimum thickness of GI sheet shall be 18 G.

5. **Access panel**

- 5.1 A hinged and gasketed access panel shall be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.

6. **Miscellaneous**

- 6.1 All ducts above 450 mm are to be cross broken to provide rigidity to the ducts.
- 6.2 All duct work joints are to be true right angle or approaching with all sharp edges removed.
- 6.3 Sponge rubber gaskets also to be provided behind the flange of all grilles.
- 6.4 Each shoot from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the shoot.
- 6.5 Inspection doors measuring at least 450 mm x 450 mm are to be provided in each system at an appropriate location, as directed by engineer-in-charge.
- 6.6 Diverting vanes must be provided at the bends exceeding 600 mm and at branches connected into the main duct without a neck.
- 6.7 Proper hangers and supports should be provided to hold the duct rigidly, to keep them straight and to avoid vibrations additional supports are to be provided where required for rigidity or as directed by engineer-in-charge.
- 6.8 The ducts should be routed directly with a minimum of directional change.
- 6.9 The duct work shall be provided with additional supports/hangers, wherever required or as directed by the engineer-in-charge, at no extra cost.
- 6.10 All duct supports, flanges, hangers and damper boxes etc. shall be given 2 coats of red oxide paint before installation and one coat of aluminium paint after the erection, at no extra cost.
- 6.11 All angle iron flanges to be welded electrically and holes to be drilled.
- 6.12 All the angle iron flanges to be connected to the gss ducts by rivets at 100 mm centres.

- 6.13 All the flanged joints, to have a 4 mm thick felt packing stack to the flanges with shellac varnish. the holes in the felt packing are to be burnt through.
- 6.14 The g.s.s. ducts should be lapped 6 mm across the flanges.
- 6.15 The ducts should be supported by approved type supports at a distance not exceeding 2.4 metres.
- 6.16 Sheet metal connection pieces, partitions and plenums required, shall be constructed of 1.25 (18 gauge) sheet thoroughly stiffened with 25 mm x 25 mm angle iron braces and fitted with access doors.

7. **Grilles**

- 7.1 The supply and return air grilles shall be fabricated from aluminium extruded sections and the supply air grilles shall have single louvers and the return air grille shall have single horizontal extruded section fixed louvers the grilles may or may not be with an outer frame.
- 7.2 The grilles shall have opposed blade dampers of m.s. black sheets, which shall be key operated from the grille face wherever required.
- 7.3 The damper blades shall be of 1.25 mm (18 gauge) m.s. black sheets and shaped to form air tight joints the frame work for dampers shall be fabricated from 1.00 mm (18 gauge) m.s. black sheet the grill flange shall be fabricated out of 25 x 25 x 1.5 mm aluminium angle grilles longer than 450 mm shall have intermediate supports for the horizontal louvers.

7.4 **Linear Grille**

The linear grille shall be of 1.25 mm (18 G) aluminium extruded section with flush mounted with single louvers for air flow direction adjustment.

8. **Diffusers**

- 8.1 The ceiling type round or square diffusers shall be of 1.25 mm (18 gauge) aluminium extruded sections with flush or step down face, as specified with fixed pattern and round neck.
- 8.2 The diffusers shall be die formed for proper air diffusion.
- 8.3 All supply diffusers shall be provided with m.s. sheet dampers, with knurled knobs for adjustment from the bottom.

9. **Painting**

- 9.1 All grilles, and diffusers shall be anodised or powder coated, as required, before installation.

9.2 All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish.

9.3 All grilles, diffusers & registers shall be provided with rubber gasket between flanges and the wall or ceiling.

10. **Testing**

10.1 After completion, all duct system shall be tested for air leakage.

10.2 The entire air distribution system shall be balanced to supply the air quantity as required in various areas and the final balance of air quantity through each outlet shall be submitted to the engineer-in-charge for approval.

11.0 **Fire Rated Duct:-**

All fire rated duct shall be fabricated from 1.25mm thick GI sheet irrespective of duct size. Ducts shall be painted with fire resistant paint and shall be suitable for 250 deg 2 hrs rating. All accessories shall be suitably fire rated for 250 deg 2 hours.

PIPE WORK

1. General:

All piping work shall conform to quality standards and shall be carried out as per specifications and details given hereunder: -

2. Pipes:

- 2.1 All pipes in sizes upto 50 mm dia shall be m.s. e.r.w tube (black steel) heavy class as per i.s. 1239-79 (with latest amendments)
- 2.2 All pipes in sizes 65 mm to 150 mm dia shall be m.s. e.r.w. tube (black steel) heavy class, as per i.s. 1239/79 (with latest amendments).
- 2.3 All pipes in sizes above 150 mm dia shall be m.s. e.r.w. tube (black steel) of minimum 6 mm thickness as per i.s. 3589 with amendment (latest).

3. Fittings :

- 3.1 The dimensions of the fittings shall conform to i.s. 1239/69 part-ii unless otherwise indicated, in the specifications.
- 3.2 All bends in sizes upto and including 150 mm dia, shall be ready, made of heavy duty, wrought steel of appropriate class.
- 3.3 All bends in sizes 200 mm and larger dia, shall be fabricated from pipes of the same dia and thickness, with a minimum of 4 sections, and having a minimum centre line radius of 1.5 diameter of pipes.
- 3.4 All fittings such as branches reducers etc. in all sizes shall be fabricated from pipes of the same dia and thickness, and its length should be at least twice the dia of the pipe.
- 3.5 The branches may be welded straight to the main line, without making a separate fitting, where specified on drawings or required by engineer-in-charge.
- 3.6 Blank ends are to be formed with flanged joints and 6 mm thick blank between flange pair for 150 mm and over, in case where, a future extension is to be made otherwise blank end discs of 6 mm thickness are to be welded on, with additional cross stiffeners from 50 mm x 50 mm m.s. heavy angles, for sizes upto 350 mm. All ends larger than 400 mm dia shall have dished ends.
- 3.7 Auto air vent valves (included in piping) shall be provided at all high points in the piping system for venting with a size of 25mm for pipes up to 100 mm and 40mm for larger pipes

4. Flanges:

- 4.1 All flanges shall be of mild steel as per i.s. 6392/71 and shall be steel slip-on-type, welded to the pipes, flange thickness shall be to suit class-ii pressures.
- 4.2 Flanges may be tack welded into position, but all final welding shall be done with joints dismantled 3 mm thick gaskets shall be used with all flanged joints. The gaskets shall be fibre re-inforced rubber as approved by the engineer-in-charge. Special adhesive compound shall be used between flanges of steam, air and gas lines.
- 4.3 Flanges shall be used as follows: -
 - 4.3.1 Counter flanges for equipment having flanged connections.
 - 4.3.2 Flanged pairs shall be used on all such equipment, which may require be isolating or removing for service e.g. pumps, refrigeration machines, air handling units etc.
 - 4.3.3 All threaded valves shall be provided with nipples and flanged pairs on both sides to permit flange connections, for removal of valves from main lines for repair/replacement.

5. **Valves:**

5.1 **Butterfly Valves**

- 5.1.1 The butterfly valve shall consist of cast iron body preferably in two piece construction.
- 5.1.2 The disc shall consist of disc pivot and driving stem shall be in one piece centrally located.
- 5.1.3 The valve seat shall be synthetic material suitable for water duty it shall line the whole body.
- 5.1.4 The disc should move in slide bearings on both ends with 'O' ring to prevent leakage.
- 5.1.5 The handle should have arrangement for locking in any set position.
- 5.1.6 The valve should be suitable for 16 kg/sq.cm working pressure with PN 16 rating.

5.2 **Motorized Butterfly Valves with actuator**

5.2.1 Butterfly Valves

- 5.2.1 The butterfly valve shall consist of cast iron body preferably in two piece construction.
- 5.2.2 The disc shall consist of disc pivot and driving stem shall be in one piece centrally located. Material: Cast bronze or Stainless steel.

- 5.2.3 The valve seat shall be synthetic material suitable for water duty. It shall line the whole body.
- 5.2.4 The disc should move in slide bearings on both ends with 'o' ring to prevent leakage.
- 5.2.5 The handle should have arrangement for locking in any set position.
- 5.2.6 The valve should be suitable for 16 Kg/cm² working pressure with PN 1.6 rating.
- 5.2.7 The actuators of motorized butterfly valve shall be BMS compatible.
- 5.3 ON/OFF Motorized butterfly valve with actuator for Chillers, condenser & Cooling Towers
- 5.3.1 Motorized valve for chillers, cooling towers shall be 2 position ON/OFF type Butterfly valve with standard train. The valve shall be controlled by an electric actuator mounted directly on the valve. The actuator shall have a reversible synchronous motor and generate the desired stroke by gear train. It shall be suitable for hook up to any major BMS.
- 5.4 Actuator
- 5.4.1 Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
- 5.4.2 Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required flow.
- 5.4.3 Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.
- 5.5 The check valves shall be wafer type. The body shall be of cast iron and the plate of aluminium bronze. The valve shall have plain face and shall have a synthetic seal. The valve shall be suitable for 16 kg /cm² pressure.
- 5.6 All gauge cocks shall be of gunmetal plug type, complete with siphon (brass chrome plated).
- 5.7 All drain valves shall be of gunmetal with a hose union connection of one hand.
- 5.8 All valves on the return line of fan coil units shall be as in 5.6 but without integral water strainer.
6. **Balancing Valves:**
- 6.1 The balancing valves upto 80 mm dia shall be of gun metal screwed type confirming to b.s. 5154 or equivalent specifications.
- 6.2 The valve shall be cast gunmetal astm b-62 and complete with non rising spindle. ptfе disc seal cast metal hand wheel.

- 6.3 The port opening shall permit precise regulation of flow rate, by accurately measuring the pressure drop across the port.
- 6.4 The valve shall be complete with two ports for connections to a mercury manometer to measure the pressure drop, as well as a drain port.
- 6.5 The spindle shall have a shielded screw to set the flow at the desired level.
- 6.6 This valve shall be used wherever specified.

7. **Strainers:**

- 7.1 The strainers shall either be pot type or 'y' type with cast iron or fabricated steel body tested upto pressure applicable for the valves as shown on the drawings.
- 7.2 The strainers shall have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet to catch iron fillings.
- 7.3 Pot strainers shall be provided with flanged connections and 'y' strainers shall be provided with flanged ends.
- 7.4 The strainers shall be designed to facilitate easy removal of filter screen for cleaning, without disconnection of pipe line.

8. **Jointing:**

- 8.1 All pipe lines shall be welded type.
- 8.2 Square cut plain ends will be welded for pipes upto and including 100 mm dia.
- 8.3 All pipes 125 mm dia or larger will be bevelled by 35 deg before welding.

9. **Miscellaneous:**

- 9.1 Provide all pipe work as required to make the apparatus connected complete and ready for regular and safe operation. Unless otherwise noted connect all apparatus and equipment in accordance with manufacturer's standard details, as approved by engineer-in-charge.
- 9.2 Unless otherwise specified, pitch the lines of piping as follows: -

All condensation drainage, including air handling unit and fan coil unit shall be pitched in the direction of flow to ensure adequate drainage, with an adequate trap seal to prevent leakage of air due to static pressure developed by air conditioning units. Pitch, 20 mm per metre wherever possible, but not less than 10 mm per metre.

Drains from other equipment shall be pitched similarly without trap seal.

- 9.3 Provide necessary valves (included in piping) and capped connections for all low

points in piping system, where necessary or required for draining systems. Provide isolating valves & drain valves in all risers to permit repairs without interfering with the rest of the system.

- 9.4 During construction, temporarily close, open ends of pipes with sheet metal caps, where necessary, or required to prevent debris from entering the piping system.
- 9.5 Support piping independently of all equipment so that the equipment is not stressed by the piping weight or expansion.
- 9.6 To facilitate the maintenance, repair and replacement:
 - 9.6.1 Provide shut-off valves where indicated and for individual equipment, units at inlet and outlet, to permit unit removal for repairs, without interfering with the remainder of the system. Additional shut-off valves shall be provided as required to enable all systems to be fully sectionalized. By-pass and stop valves shall be provided for all automatic control valves as specified.
 - 9.6.2 Arrange piping for maximum accessibility for maintenance and repair, locate valves for easy access and operation. No valves shall be installed with handles pointing down, unless unavoidable.
 - 9.6.3 Cut the pipes accurately according to measurements, established at building site & work into place without springing or forging.
 - 9.6.4 Pipe supports shall be adjustable for height and prime coated with rust preventive paint & finish coated with grey paint, both as approved by engineer-in-charge. The spacing of pipe supports shall not be more than that specified below: -

Nominal pipe size mm	Spacing (metres)
15 	1.25
20 & 25 	2.00
32,30,50 & 65	2.50
80,100 & 125	2.50
150 & above 	3.00

- 9.6.5 Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stresses on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of metallic approved dash fasteners.
- 9.6.6 Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.
- 9.6.7 Where pipes are to be buried under ground, they should be coated with one coat of bituminous paint. The top of the pipes shall not be less than 75 cms from the ground

level. Where this is not practical permission of engineer-in-charge shall be obtained for burying the pipes at lesser depth. The pipes shall be surrounded on all sides by sand cushions of not less than 15 cms. After the pipes have been laid and top sand cushions provided, the trench shall be refilled with the excavated soil, excess soil shall be removed from the site of work by the contractor.

9.6.8 The following supporting arrangements for two piping shall be provided as below.

Sr. No.	Nominal pipe Size (mm)	MS rod for ceiling support (mm)	Floor Support (mm)	Base Support
1	Upto 65 mm	10 mm	80 mm MS pipe	40x40x5 thick angle
2	80 mm to 125 mm	10 mm	80 mm MS pipe	50x50x5 thick angle
3	150 mm to 250 mm	12 mm or 50x50x6 thick angle	80 mm MS pipe	75x75x5 thick angle or 80x40 channel
4	300 mm to 350 mm	16 mm or 80x40 channel	80 mm MS pipe	100x50 channel
5	400 mm to 500 mm	16 mm or 100x50 channel	100 mm MS pipe	70x40 channel (box) []
6	600 mm to 700 mm	20 mm or 100x50 channel	100 mm MS pipe	ISMC 200

Wherever more than two pipes shall be hanged, the spacing of supports shall be taken as for minimum dia pipe. and piping support arrangement shall be got approved with submitting of shop drawing.

10. Hangers & Supports:

- 10.1 Hangers and supports shall be provided and installed for all piping and tubing wherever indicated, required or otherwise specified. Wherever necessary, additional hangers and supports shall be provided to prevent vibration or excessive deflection of piping and tubing.
- 10.2 All hangers and supports shall be made of steel or other durable and non-combustible materials, galvanized or plated. Wood wire or perforated strap iron shall not be used as permanent hangers or supports.
- 10.3 Hangers shall be supported from structural steel, concrete inserts & pipe racks, as specifically approved.
- 10.4 No hangers shall be secured to underside of light weight roof decking and light weight floor glass.
- 10.5 Mechanical equipment shall be suspended midway between steel joists and panel points.
- 10.6 Drilling or punching of holes in steel joist members will not be permitted.

11. **Sleeves:**

- 11.1 Where pipes pass through floors, walls, etc provide galvanized steel pipe sleeves 50 mm larger than outside diameter of pipe. Where pipes are insulated, sleeves shall be large enough to ample clearance for insulation.
- 11.2 Where pipes pass through outside walls or foundations, the space between pipe and sleeve shall be caulked with lead wool and oakum.
- 11.3 The centre of pipes shall be in the centre of sleeves, and sleeves shall be flush with the finished surface.

12. **Expansion or Contraction:**

- 12.1 The contractor shall provide for expansion and contraction of all piping installed by the use of swing connections and expansion loops.

13. **Arrangement and Alignment of Piping:**

- 13.1 All piping shall be arranged and aligned in accordance with the drawings as specified. Where special conditions are encountered in the field, the arrangement and alignment of piping shall be as directed by the engineer-in-charge.
- 13.2 The piping shall be installed in a uniform manner, parallel to or perpendicular to walls or ceilings, and all changes in directions shall be made with fittings. The horizontal piping shall be run at right angles and shall not run diagonally across rooms or other piping. Wherever possible all piping shall be arranged to provide maximum head room.
- 13.3 All piping shall be installed as directly as possible between connecting points in so far as the work of other trades permits. Where interference occurs with another trade whose work is more difficult to route this contractor shall reroute his pipes as required to avoid interference, at the discretion of the engineer-in-charge.
- 13.4 All piping shall be carefully installed to provide for proper alignment, slope and expansion.
- 13.5 The stresses in pipe lines shall be guided and pipes shall be supported in such a manner that pipe lines shall not creep, sag or buckle.
- 13.6 Anchors and supports shall be provided wherever necessary to prevent any misalignment of piping.
- 13.7 Small tubing gauges, controls or other equipment installed on any apparatus, shall not be coiled nor excessive in length, but shall be installed neatly, carefully bent at all changes in direction, secured in place and properly fastened to equipment at intervals to prevent sagging.
- 13.8 The piping shall be grouped wherever practical and shall be installed uniformly in straight parallel lines in either vertical or horizontal positions.

14. Testing:

- 14.1 In general, tests shall be applied to piping before connection of equipment and appliances. In no case shall the piping, equipment or appliances be subjected to pressures exceeding their test ratings.
- 14.2 The tests shall be completed and approved before any insulation is applied. Testing of segments of pipe work will be permitted, provided all open ends are first closed, by blank-offs or flanges.
- 14.3 After tests have been completed the system shall be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fillings and debris.
- 14.4 All piping shall be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/sq.cm for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing shall be rectified to the satisfaction of the engineer-in-charge, without any extra cost.
- 14.5 All the piping systems shall be tested in the presence of the engineer-in-charge or their authorised representative. Advance notice of test dates shall be given and all equipments, labour, materials required for inspection, and repairs during the test shall be provided by the contractor. A test shall be repeated till the entire systems are found to be satisfactory to the above authority. The tests shall be carried out for a part of work if required by engineer-in-charge in order to avoid hinderance in the work of the insulation contractor.
- 14.6 All steam and condensate pipes shall be tested and proven tight under hydrostatic pressure of 20 kg/sq.cm, unless otherwise stated, for a minimum period of 4 hours without drop in pressure.
- 14.7 Miscellaneous piping, tests with air at 10.5 kg/sq.cm for a minimum of 24 hours without drop in pressure.
- 14.8 The contractor shall make sure that proper noiseless circulation is achieved through all piping systems. If due to poor bond, proper circulation is not achieved, the contractor shall bear all expenses for carrying out the rectification work including finishing of floors, walls and ceiling damaged in the process of rectifications.
- 14.9 The contractor shall provide all labours and materials to make provision for removing water and throwing it at the proper place, during the testing or/and after the testing to avoid damages to employer or other contractors ' properties. Any damages caused by the contractor to the employer or other contractors' properties, shall be borne by the contractor.

15.0 Copper Piping:

- 15.1 Heavy gauge soft copper tubing, type m shall be used to make connections to equipment, wherever required or specified by engineer-in-charge.

15.2 Flare fittings e.g. flare nuts, tees, elbows, reducers etc. shall all be of brass.

16. Refrigerant Piping:

16.1 The refrigerant circuit piping shall be heavy class m.s the fittings shall be heavy class. The pipes and fittings shall be connected by means of welded joints. The connections to gauges, controls etc. shall be with soft copper tubing and flare fittings.

16.2 The refrigerant valves, required in the circuit shall be as follows.

	Valve Size	Valve Material	Type of Connections
16.2.1	upto 12 mm	brass/packless type	flare fittings
16.2.2	16mm & above	brass/steel packed type	brazed/welded

note :- all valves shall be tested against leaks upto 20 kg/sq.cm.

16.3 The strainers for the refrigerant liquid line shall be 'y' type with gun metal body and bronze filter screen of fine mesh. The filter screen shall be easily removable type without dismantling the strainer from the circuit.

16.4 The moisture indicator in the liquid line shall have leak proof glass on opposite sides to permit easy inspection of the liquid refrigerant.

17. Drain Piping:

17.1 The drain piping shall be medium class galvanised steel as per is 1239/1979.

17.2 The fittings shall be of 'R' brand or equal forged with screwed connections.

17.3 The gate valves (included in piping) shall be of gun metal as described earlier.

17.4 Pipe crosses shall be provided at bends, to permit easy cleaning of drain line.

17.5 The drain line shall be provided upto the nearest drain trap and pitched towards the trap.

17.6 Drain lines shall be provided at all the lowest points in the system, as well as at equipments, where leakage of water is likely to occur, or to remove condensate and water from pump glands.

18. Painting:

18.1 All pipes supports, hangers, etc., shall be given two coats of red oxide primer.

18.2 All pipes, which are not to be insulated, shall then be given one coat of finish paint, of a type and colour, as approved by the engineer-in-charge.

INSULATION

1. **General:**

The insulation of water piping, air handling units, ducting, chillers etc., shall be carried out as per specifications given below:

2. **Materials:**

The materials to be used for insulation shall be as follows, unless some other material is specifically mentioned elsewhere.

2.1 **Pipe Insulation:**

2.1.1 The insulation for chilled water and drain piping, chillers, pump etc. shall be carried out from 'TF' quality expanded polystyrene having a 'K' value of 0.014 kcal/hr/°c. at mean temperature of 10°c. and a density of 24 to 28 kgs/cubm.

2.2 **Other Insulation**

2.2.1 The material for acoustic treatment of ducts, rooms, roofs etc. shall be resin bonded fibre glass, as described earlier, conforming to i.s. 8183 of 1976. The density of fibre glass shall be 32-48 kg/cub.m and the material shall be in the form of slabs of uniform density. The 'K' value at 10°c. shall not be less than 0.028 kcal/mhr/°c. Facing shall be provided with 0.5 mm perforated aluminium sheet held with G.I. nuts bolts or nailed to the batten work as required.

2.2.2 The materials for duct insulation (Option A) shall be fire retardant, self extinguishing aluminium foil faced closed cell crossed linked polyethylene. Material shall be class1 as per BS 476 part 7 The density of insulation shall not be less than 32 kg./cub m. And material shall be in the form of blankets/rolls of uniform thickness. The 'K' value at 10°C shall not exceed 0.032 W/m K. It shall be factory faced with aluminium foil on one side reinforced and fused to the insulation material ($\mu \geq 10000$, water vapour diffusion resistance).

2.2.3 The material for duct insulation (Option B) shall be aluminium foil faced closed cell elastomeric nitrile rubber. The thermal conductivity shall not exceed 0.038 W/m k at an average temperature of 30 deg C. The density of nitrile rubber shall be 40-60 Kg/m³. The insulation material shall be fire rated for class 'O' as per BS 476 part 6 for fire propagation test and class '1' as per BS 476 part 7 for surface spread of flame test. Water vapour permeability shall not be less than .024 per m inch ($\mu \geq 10000$, water vapour diffusion resistance).

Thickness of insulation shall be as specified for the individual applications. Each lot of insulation material delivered at site shall be accompanied with manufacturer test certificate for thermal conductivity value and density.

3. **Cold Equipment Insulation:**

3.1 The complete shell of the chiller (factory insulated) as well as its two heads, the

chilled water pumps, and AHUs shall all be insulated.

- 3.2 The insulation shall be 'TF' quality expanded polystyrene for chilled water pipes (thickness as per ECBC to achieve R values).
- 3.3 All insulation except chiller heads shall be covered with glass cloth and fire retardant epoxy coating with UV protection.
- 3.4 The insulation on the two end heads of the chiller shall be covered with 0.80 mm g.i. casing to permit easy removal.

4. **Chilled Water Piping/Drain Piping:**

4.1 For EPS (TF quality)

4.1.1 The chilled water and drain pipes shall be insulated with 'TF' quality expanded polystyrene. Thickness of the insulation shall be as specified for the individual application as per ECBC 2007 requirement. Samples of insulation material shall be approved, and test certificates for the same shall be submitted for approval before application. Adhesives used if any shall be suitable for both and cold application for the temperature range mentioned above or as per the manufacturer's recommendations.

4.1.2 Preformed pipe sections shall be used for pipes upto and including 350 mm dia.

4.1.3 Pipes above 350 mm dia. shall be insulated with insulation slabs cut in mitred sections.

4.1.4 **Installation**

Chilled Water and Drain Piping

The pipe shall be thoroughly cleaned with a wire brush and rendered free from all rust and grease.

The pipes shall be treated with a coat of cold setting compound.

The insulation preformed section shall be fixed tightly to the surface taking care to seal all joints.

All joints along the circumference of the pipe sections shall be sealed with adhesive.

The insulation than shall be covered with glass cloth and fire retardant epoxy coating and UV protection for exposed areas.

Insulation on pipes in areas exposed to weather or underground shall additionally be covered with tar-felt sheets and fixed with G.I. wires of 1.0 mm. The tar felt sheet shall be stuck with bitumen r 85/25.

5. **Refrigerant Piping:**

5.1 The suction line of refrigerant piping shall be insulated with class O elastomeric insulation.

6. **Ducting:**

6.1 The air handling ducts shall be insulated with nitrile rubber class 'O' as per BOQ.

6.2 Duct insulation thickness shall be as follows:

Duct in conditioned space - 19 mm thick

Duct in unconditioned space - 25 mm thick

Duct with treated fresh air - 25 mm thick

6.3 **Installation**

6.3.1 Clean the surface with a wire brush and make it free from rust and oil.

6.3.2 Apply two coats of cold setting adhesive (CPRX compound).

6.3.3 Wrap the duct with insulation blankets of the thickness mentioned elsewhere.

6.3.4 The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete and as required

7. **Walls and Ceiling Acoustic Treatments of Plant Rooms and A.H.U. Room**

7.1 **Material**

Resin bonded glass wool of density 32 kg/cub m of 50mm thickness.

8. **Installation:**

8.1 Fix 40 mm x 50 mm g.i. sheet channel at 0.5 mtr interval longitudinally then fix cross battens at 1.0 mtr centre using suitable gutties, and brass screws. The battens & gutties shall be treated with fire retardant chemical before fixing.

8.2 Fill each rectangle with 50 mm glass wool wrapped in glass cloth.

8.3 Tie with 24 gauge G.I. wires at 300 mm intervals.

8.4 Then cover with 26 gauge (0.50 mm) perforated g.i. sheet having 3mm perforations at 6 mm centres. Overlap all joints and provide beading of 25 mm by 2 mm flats.

ELECTRICAL WIRING

AS PER LATEST CPWD SPECIFICATIONS 2017 for HVAC Works.

TESTS AT SITE

1. General:

The contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the architect, in accordance with the provisions of the applicable ASHRAE standards or approved equal and furnish necessary test certificates from manufacturers.

2. Compressors/Condensers/Chillers/Evaporators/Pumps etc.

- 2.1 Identification of materials in accordance with test certificates.
- 2.2 Inspection of various laboratory test certificates for physical properties and technical composition conducted on test samples of materials to be used for fabrication, forgings etc. for all important components of various equipment.
- 2.3 Hydraulic test for various components and assembled equipments at 1.5 times design pressure or double the operating pressure whichever is higher.
- 2.4 Pneumatic leak test after assemblies at design pressure
- 2.5 Static and dynamic balancing on electronic precision machine for rotating parts, links, impellor/crank shaft assemblies etc.
- 2.6 Inspection of assemblies and dis-assemblies of various parts of equipments and complete equipments themselves as desired by inspection engineer.
- 2.7 Noise level test for various rotating/reciprocating equipments.
- 2.8 Pressure drop test for condenser, chiller and evaporator.
- 2.9 Inspection of manufacturer's test certificates shall be supplied for all electrical motors.
- 2.10 Inspection of welding including welders qualifications as desired by inspection engineers.
- 2.11 For compressor assembly, electronic leak, air running test, pneumatic test with dry nitrogen and leak test in water.

3. Air Handling Units :

3.1 Blowers

- 3.1.1 Identification of material in accordance with test certificates.
- 3.1.2 Dynamic/static balancing of impeller.

3.1.3 Performance test as per applicable codes.

3.2 **Coils**

3.2.1 Identification of material in accordance with test certificates.

3.2.2 Pneumatic test.

3.3 **Filters**

3.3.1 Manufacturer's test certificates also to be produced for the assembled A.H.U. final dimensional check will be done. Inspection will be done during assembly of components for quality of workmanship, painting etc.

Piping : materials check for specifications and size.

3.4 **Valves**

Hyd./Pneumatic test certificates.

3.5 **Motors**

Manufacturer's test certificate as per motor data sheet.

3.6 **Instruments and Controls**

Visual examination.

4. **For Associates Works at Site:**

4.1 All electrical items will be subjected to inspection at any stage during manufacturing activity. Routine electrical test as per relevant codes. Inspection of manufacturer's test certificates.

4.2 Inspection of raw materials to be used for fabrication and assembly and inspection of manufacturer's certificates.

4.3 Inspection of welding including welders qualification as desired by inspection engineers. Inspection of fabricated items.

4.4 Pressure testing of pipe fit used for the refrigerant and water services.

4.5 Pressure testing,leak testing of complete piping network for chilled water. Condenser water and refrigerant/services.

4.6 Vacuuming and gas/oil charging for refrigeration system.

4.7 Checking of electrical circuits (power & controls) and checking functioning of controls of refrigerant systems and other circuits of air conditioning plant.

- 4.8 Checking of calibration of controls and instrumentation
- 4.9 Checking of assemblies for electrical control panel, instruments panels, local panels (dimensional and functional) annunciator panels etc.
- 4.10 Inspection of complete electrical installation at site.
- 4.11 Installation of main equipments like compressor, condenser, chiller, evaporator.
- 4.12 Performance testing of complete A/C plant as per specifications.
5. The above inspection procedure is given for general guidance and information of vendors and inspection of purchaser/consultant is strictly not limited to these and inspection engineer of purchaser/consultant will have full right to have detailed inspection at any stage right from placement of order to completion of project as desired by inspection engineer, co-ordination of inspection agency of purchaser/consultant with his factory/sub-vendor's factory/erection site will be the sole responsibility of successful vendor after placement of order for complete air conditioning plant covered under these technical specifications.

6. **Piping System:**

- 6.1 In general pressure tests shall be applied to piping only before connection of equipment and appliances. In no case shall piping, equipment or appliances be subjected to pressure exceeding their test ratings.
- 6.2 Tests shall be completed and approved before any insulation is applied.
- 6.3 After tests have been completed, the system shall be drained and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fittings, and debris.

6.4 **Water Piping**

All water piping shall be tested and proven tight under hydrostatic pressure of 1 1/2 times the design pressure unless stated otherwise in the specifications. Prescribed pressure shall be maintained for four hours.

7. **Duct Work:**

- 7.1 All branches and outlets shall be tested for air quantity, and the total of the air quantities shall be within plus five percent (5%) of fan capacity.
- 7.2 Fire dampers, volume dampers and splitter dampers shall be tested for proper operation.

8. **Balancing and Adjustment:**

All air handling ventilation equipment, duct work and outlets shall be adjusted and

balanced to deliver the specified air quantities indicated, at each inlet and outlet, on the drawings. If these air quantities cannot be delivered without exceeding the speed range of the sheaves or the available horse power, the architect shall be notified before proceeding with the balancing of air distribution system.

9. Electrical Equipment:

- 9.1 All electrical equipment shall be cleaned and adjusted on site before application of power.
- 9.2 The following tests shall be carried out:
 - 9.2.1 Wire and cable continuity tests.
- 9.3 Insulation resistance tests, phase to phase and phase to earth, on all circuits and equipment, using a 500 volt meggar. The meggar reading shall be not less than one mega ohm.
- 9.4 Earth resistance between conduit system and earth must not exceed half (1/2) ohm.
- 9.5 Phasing out and phase rotation tests.
- 9.6 Operating tests on all protective relays to prove their correct operation before energising the main equipment.
- 9.7 Operating tests on all starters, circuit breakers, etc.

10. Performance Tests :

- 10.1 The installation as a whole shall be balanced and tested upon completion, and all relevant information, including the following shall be submitted to the architects.
 - 10.1.1 Air volume passing through each unit, duct, grilles, apertures.
 - 10.1.2 Differential pressure readings across each filter, fan and coil, and through each pump.
 - 10.1.3 Static pressure in each air duct.
 - 10.1.4 Electrical current readings, in amperes of full and average load running, and starting, together with name plate current of each electrical motor.
 - 10.1.5 Continuous recording over a specified period, of ambient wet and dry bulb temperatures under varying degrees of internal heat loads and use and occupation, in each zone of each part of the building.
- 10.2 Daily records should be maintained of hourly readings, taken under varying degrees of internal heat load and use and occupation, of wet and dry bulb temperatures, upstream "on-coil" of each cooling coil. Also suction temperatures and pressures for each refrigerating unit. The current and voltage drawn by each machine.

10.3 Any other readings shall be taken which may subsequently be specified by the architect.

11. **Miscellaneous:**

11.1 The above tests are mentioned herein for general guidance and information only but not by way of limitation to the provisions of conditions of contract and specification.

11.2 The date of commencement of all tests listed above shall be subject to the approval of the architect, and in accordance with the requirements of this specification.

11.3 The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system if the architect requests such a test for determining specified or guaranteed data as given in the specification or on the drawings.

11.4 Any damage resulting from the tests shall be repaired and/or damaged material replaced, all to the satisfaction of the Engineer.

11.5 In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommended after the adjustment or repairs have been completed.

11.6 The contractor must inform the architect when such tests are to be made, giving sufficient notice, in order that the architect or his nominated representative may be present.

11.7 Complete records of all tests must be kept and 3 copies of these and location drawings must be furnished to the architect.

11.8 The contractor may be required to repeat the test as required, should the ambient conditions at the time not given, in the opinion of the architect, sufficient and suitable indication of the effect and performance of the installation as a whole or of any part, as required.

MODE OF MEASUREMENTS

1. Unit Prices in the Schedule of Quantities:

- 1.1 The item description in the schedule of quantities is in the form of a condensed resume. The unit price shall be held to include every thing necessary to complete the work covered by this item in accordance with the specifications and drawings. The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.
- 1.2 The unit price of the various items shall include the following:
 - 1.2.1 All equipment, machinery, apparatus and materials required as well as the cost of any tests which the consultant may request in addition to the tests generally required to prove quality and performance of equipment.
 - 1.2.2 All the labour required to supply and install the complete installation in accordance with the specifications.
 - 1.2.3 Use of any tools, equipment, machinery, lifting tackle, scaffolding, ladders etc. Required by the contractor to carry out his work.
 - 1.2.4 All the necessary measures to prevent the transmission of vibration.
 - 1.2.5 The necessary material to isolate equipment foundations from the building structure, wherever necessary.
 - 1.2.6 Storage and insurance of all equipment apparatus and materials.
- 1.3 The contractor's unit price shall include all equipment, apparatus, material and labour indicated in the drawings and/or specifications in conjunction with the item in question, as well as all additional equipment, apparatus, material and labour usual and necessary to make in question on its own (and within the system as a whole) complete even though not specifically shown, described or otherwise referred to.

2. Measurements of Sheet Metal Ducts, Grilles/Diffusers etc.

2.1 Sheet Metal Ducts

- 2.1.1 All duct measurements shall be taken as per actual outer duct surface area including bends, tees, reducers, collars, vanes & other fittings. Gaskets, nuts, bolts, vibration rotation pads are included in the basic duct items of the boq.
- 2.1.2 The unit of measurements shall be the finished sheet metal surface area in metres squares. No extra shall be allowed for lapse and wastages.

- 2.1.3 All the guide vanes, deflectors in duct elbows, branches, grille collars quadrant dampers etc. shall be measured for actual sheet metal surface and paid for at the same rate as duct of same thickness.
- 2.1.4 The unit duct price shall include all the duct hangers and supports, exposing of concrete reinforcement for supports and making good of the same as well as any materials and labour required to complete the duct frame.

2.2 **Grilles/Diffusers**

All grilles/diffusers as per tender requirements shall be treated as a lump sum item. Where extra grilles diffusers are ordered upto award of work, they should be measured as follows:

- 2.2.1 All measurements of grilles/diffusers shall be the actual neck size excluding the outer flanges.
- 2.2.2 The square or rectangular grilles/diffusers shall be measured in plain sq.m.
- 2.2.3 All round diffusers shall be measured by their diameters in cm.
- 2.2.4 All linear diffusers shall be measured as per actual length in metres.

3. **Measurements of Piping, Fittings, Valves, Fabricated Items :**

3.1 **Pipe**

Including water piping, steam piping and all other piping required to be executed at site for completion of the works.

- 3.1.1 All pipes shall be measured in linear metre (to the nearest cm) along the axis of the pipes and rates shall be inclusive of all fittings e.g. tees, bends, reducers, elbows etc. deduction shall be made for valves in the line.
- 3.1.2 Exposing reinforcement in wall and ceiling and floors of possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and schedule of quantities.
- 3.1.3 Rates quoted shall be inclusive of providing and fixing vibration pads and wooden pieces, wherever specified or required by the project co-ordinator.
- 3.1.4 Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.
- 3.1.5 The length of the pipe for the purpose of payment will be taken through the centreline of the pipe and all fittings (e.g. tees, bends, reducers, elbows, etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges, section 3.2 below applies.

3.2 Valves and Flanges

- 3.2.1 All the extra ci & cm flanged valves shall be measured according to the nominal size in mm and shall be measured by number. Such valves shall not be counted as part of pipe length hence deduction in pipe length will be made wherever valves occur.
- 3.2.2 All gun metal (gate & globe) valves shall include two Nos. of flanges and two numbers 150 mm long ms nipples, with one side threaded matching one of the valves, and other welded to the M.S. slip-on-flange. Rate shall also include the necessary number of bolts, nuts and washers, 3 mm thick insertion gasket of required temp, grade and all items specified in the specifications.
- 3.2.3 The rates quoted shall be inclusive of making connections to the equipment, tanks, pumps etc. and the connection made with an installed pipe line shall be included in the rates as per the BOQ.

3.3 Structural Supports

Structural supports including supports fabricated from pipe lengths for pipes shall be measured as part of pipe line and hence no separate payment will be made. Rates shall be inclusive of hoisting, cutting, jointing, welding, cutting of holes and chases in walls, slabs or floors, painting supports and other items as described in specifications, drawings and schedule of quantities or as required at site by project co-ordinator.

3.4 Copper Connections for Fan Coil Units

- 3.4.1 Copper connection assembly for making connections to the fan coil units shall be measured, as part of the fan coil unit price and shall include brass flare nuts, brass straight connector, brass tees, brass reducing fittings, fixing of automatic 3 way valve, making connections and leak testing, complete assembly as per specifications and drawings. Nothing extra shall be payable on account of any variation in the length of copper pipe.

4. Insulation:

- 4.1 The measurement for vessels, piping, and ducts shall be made over the bare uninsulated surface area of the metal.

4.2 Pipes, Ducts & Vessels

4.2.1 Pipes

The measurements for installation of piping shall be made in linear metres through all valves, flanges, and fittings. Pipes/bends shall be measured along the centreline radius between tangent points. If the outer radius is r_1 and the inner radius is r_2 the centre line radius shall be measured as $(r_1+r_2)/2$. Measurement of all valves, flanges and fittings shall be measured with the running metre of pipe line as if they

are also pipe lengths. Nothing extra over the above shall be payable for insulation over valves, flanges and fittings in pipe line/routings. Fittings that connect two or more different sizes of pipe shall be measured.

4.2.2 Ducts

The measurements for insulation of ducts shall be made in actual square metres of bare uninsulated duct surface through all dampers, flanges and fittings. In case of bends the area shall be worked out by taking an average of inner and outer lengths of the bends. Measurements for the dampers, flanges, fittings shall be for the surface dimension for the connecting duct, nothing extra over the above shall be payable for insulation over dampers, flanges and fittings in duct routing.

4.2.3 Vessels

The area of standard dished and flat ends of vessels shall be the square of the diameter of the uninsulated body of the shell. Areas for other shapes shall be the actual calculated area. There shall be no deduction or additions for nozzles, handles ribs, dampers, expansion joints etc. All projections on vessels or tanks shall be measured separately as pipe/duct.

4.3 Accessories Insulation

4.3.1 The unit of measurement for accessories such as expansion tank, pumps, chiller heads etc. shall be uninsulated are in square metres.

4.3.2 In case of curved or irregular surfaces, measurements shall be taken along the curves.

4.3.3 The unit insulation price shall include all necessary adhesives, vapour proofing and finishing materials as well as additional labour and material required for fixing the insulation.

4.4 Acoustic Duct Lining

4.4.1 In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square metres, shall be final for billing purposes.

4.4.2 The insulation/acoustic panels shall include cost of battens, supports, adhesives, vapour proofing, finished tiles/boards/sheets as well as additional labour and materials required for completing the work.

LIST OF APPROVED MAKES AND MANUFACTURERS

The makes/brands of equipment listed below are approved for installation.

For all items to be used in the work samples, catalogues and specifications are to be submitted by the contractor for approval of the Engineer In charge. Only approved makes shall be used in the works. Equivalent makes may be added with price adjustment with approval of Engineer In charge. The approved samples shall be kept in the custody of the Engineer for comparison.

S.No	Material/Item	Approved Makes
	HVAC SUBCONTRACTORS	VOLTAS/BLUE STAR/ SUVIDHA/ UNIQUE ENGINEERS / ETA/ STERLING & WILSON
	High Side Equipment	
1	Centrifugal Chilling Units with VFD (ARI Certified)	Carrier/ Trane/ York
2	Screw chiller (ARI Certified)	Carrier/Trane/York/Danhum bush
3	Scroll Chiller	Carrier/ Trane/ York/ Danhum bush
4	Primary Chilled / Condenser water Pumps (End suction back pullout)	Xylem/Grundfoss/Armstrong/wilo-Mather & Platt
5	Pumps Monoblock	Kirloskar/Beacon/Siemens/KSB/Greaves
6	Pumps Coupled with VFD	Xylem / Grundfoss/ Wilo-Mather Platt/ Armstrong
7	VFD with controls	Xylem/ Danfoss/ Grundfoss/ Wilo-Mather Platt/ Armstrong
8	Cooling Towers (CTI Approved)	Paharpur/Bell/Mihir/Marley/Advance
9	Electric hot water generator	Rapid cool/ Emerald/ Khokhar
	Air Handling Units	
10	Air Handling Units (High Static) with cooling coils	Carrier/Caryaire/Blue-star/Systemair/Voltas/VTS/ Flaktwood/ Waves/Edgtech
11	Centrifugal Fan for AHU's	Nicotra/ Comefri/ Flakt/ Kruger/VTS
12	VFD for AHU	Danfoss/ Siemens/ VTS /Allen Bradley/ ABB/ Schneider
13	Ultra Violet Germicidal Irradiation/ PHI	Ruks/Trimed/ RGF
14	Fan Coil Units	Same as AHU
15	Air washer	Ambassador/Humidin/ Roots Cooling/ Ambiator
16	Scrubber (Wet/Dry)	Wet : same as AHU, Dry: Espair/Trion/Thermax/ Rydair
17	Humidifier	Rapid cool/Emerald/Khokar
18	Fan section	Same as AHU

19	Centrifugal /Axial Flow Fans/Tube Axial (AMCA Certified)	Flakt/ Nicotra/ Comefri/ Kruger /Greenheck/System air
20	Propeller Fans	GEC (Alsthom)/ Crompton Greaves/ Khaitan/ Usha
21	Precision AC units	Emerson/ Blue box/ Stulz/ Hiross
22	Window/split AC	Hitachi/ Daikin/ O-general
23	VRV/VRF	Carrier /Hitachi/Daikin/O-general/Toshiba/Mitsubishi
24	Cassette Units-Chilled water based	Daikin/ETA/Midea
25	Inline Fans	Flakt/Nicotra/Comefri/Kruger/SystemAir/Ostberg/Greenheck
26	Heat recovery unit complete with Heat recovery wheel	Flaktwoods/ Novelaire/ DRI/ Greenheck/ Bryair
27	Heat Exchanger	Heat X/ Mark/ Alfa lavel
28	Thermal storage tank	Crystopia/ Dunhambush/ Calmac
	Electrical Equipment	
29	Main AC Panel	L&T/ Siemens / ABB/ Schneider
30	AHU/ventilation electrical panels	Tricolite/ Adlec/ Sterling & Wilson/ C&S/ Jackson Engineers/ Milestone/ Nitya/ SPC/ Risha/ Neptune/ Zeta
31	Electric Motors	Siemens/ Kirloskar/ ABB/ Crompton Greaves.
32	ACB	L&T-U power(Omega)/ GE-Entelliguard/ Siemens-3WL/ ABB/ Legrand-DMS/ Schneider-NW master pact
33	MCCB	L&T-(D shine/DL) / GE-Record Plus / Siemens-VA/ ABB-TMA/ Schneider- compact NSX
34	MCB	L&T/ Legrand-DX3/ Hager / Seimens-VA/ ABB/ MDS Lexic
35	PVC Tape	Steelgrip or equivalent as approved by engineer in-charge.
36	Push button starter	L&T/ GE / Siemens/ ABB/ Schneider
37	Auxiliary Relays/Contactors	L&T/GE/ Siemens/ ABB/ Schneider
38	Line Type Fuse	L&T/GE/ Siemens/ ABB/ Schneider
39	Timer	L&T/GE/ Siemens/ ABB/ Schneider/ Legrand
40	Terminal Block	Elmex or equivalent as approved by engineer in-charge.
41	Voltmeter/Ammeter	L&T/GE/ Siemens/ ABB/ Schneider
42	Indicating lamps	L&T/GE/ Siemens/ ABB/ Schneider
43	Selector Switches	L&T/GE/ Siemens/ ABB/ Schneider
44	Change Over Switch	L&T/GE/ Siemens/ ABB/ Schneider
45	CT/PT	L&T/GE/ Siemens/ ABB/ Schneider
	Cables	

46	Power Cables / Control Cables	CCI/ Universal/ Finolex / Rallison
47	Cable tray	OBO/ Legrand/ Cooper/ BEC
48	Cable lugs	Dowells/ Comet
	Dcting	
49	Factory fabricated duct	Ductofab/ Rolastar/ Technofab
50	G.I. Sheet	TATA/ SAIL/ Jindal
51	Spiral duct	Atco/ Seven Star
52	Grilles/Diffusers/Volume Control damper	Ravistar/ Caryaire/ Mapro
53	Fire Dampers UL listed	Caryaire/ Ravistar/ Ruskin
54	Sound Attenuator	Caryaire/ Ravistar/Trox
55	Aluminium Sheets	Balco/ Nalco/ Hindalco
	Pipes	
56	G.I.	Jindal Hissar/ Tata/ SAIL
57	M.S. upto 150 mm	Jindal Hissar/ Tata/ SAIL
58	M.S. 200 mm and above dia factory rolled	Jindal Hissar/ Tata/ SAIL
	Valves	
59	Butterfly Valves	Audco/ L&T/ Honeywell
60	Motorised butterfly valve(actuator)	Belimo/ Honeywell/ Siemens
61	Non Return Valve	Advance/ Kirloskar/ Audco
62	Balancing Valves	Advance/ Audco/ Danfoss/ Honeywell/L&T
63	Gate/Globe Valves	Leader/ Divine/ Sant/ Bankim Sarkar / Zoloto
64	GM valve upto 40mm	Leader/ Divine/ Sant/ Bankim Sarkar /Zoloto
65	Ball Valve with Y strainer	Rapid Control/ Sant/ Leader/ Zoloto
66	Pressure independent Balancing valve	Danfoss/ Flowcon/ TA
	Accessories	
67	Pot & Y-strainer	Emerald/ Sant/ Rapid cool
68	Pressure Gauge	Fiebig/ Emerald/ H Guru/ Japsin
69	Thermometer	Fiebig/ Emerald/ H Guru/ Japsin
70	Flow Switch	Rapid Control/ Anergy
71	Automatic Air Vent	Rapid Control/ Anergy
72	Suction Guide	Anergy/ Rapid Control/ Flowcon
73	Filters (pre,fine Hepa)	Thermadyne/ Spectrum/ Kirloskar /Anfilco/ Johnflower/ Dynafilter
	Insulation	

74	Expanded Polystyrene	Beardsell Ltd./ BASF / Lloyd/ Styrene packaging
75	Glass Wool	FGP Ltd./UP Twiga/ Kimmco
76	Polyurethane Foam	Malanpur /Superurethane
77	Crossed linked Polyethylene Foam	Trocellene / Superlon
78	Closed Cell Elastomeric Insulation	K-flex /Vidoflex/ Armacell/ Aeroflex
79	Non woven fibre material	Mikron/ Du pont
80	Mineral wool	Rockwool India Pvt Ltd/ Lloyd
81	Pre-moulded PUF section for pipe & pipe supports	Malanpur/ Lloyd
82	Fibreglass rigid Board/ Pipe section	FGP Ltd./ UP Twiga/ Kimmco
83	Aluminium Tape	Johnson/ Birla 3M/ Garware
84	Expansion tank(pressurized) and Air Separator	Anergy/ Grundfoss/ ITT
85	Bellows	Dunlop/ Kanwal/ Resistoflex
86	2/3-Way motorized valve for AHU/FCU	Johnson control/ Danfoss/ Siemens/ Belimo
87	Thermostats	Honeywell/ Johnson controls/ Belimo/ Danfoss/ Siemens
88	Humidistat	Honeywell/ Johnson control/ Belimo/ Danfoss /Siemens
89	Electric Strip Heaters	Escorts/ Daspas
90	Safety Thermostat for Heaters	Honeywell/ Siemens/ Danfoss/ Belimo /Siemens
91	Cooling/heating Mode Changer	Honeywell/ Siemens/ Danfoss/ Belimo/ Siemens
	Paints	
92	Enamel	ICI/ Asian/ Nerolac/ Berger
93	Bituminus	Indian Oil / HP
94	Tarfelt (for underground chilled water pipe insulation)	Indian Oil / HP
95	IBMS Approved vendor	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider
96	DDC Controllers	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider
97	Sensors(Pressure/Temperature)	Siemens/ Honeywell/ Johnson controls/ ABB/Schneider
98	VAV	Trane/ Trox/ Johnson Controls/ Caryaire/ Belimo
99	Airflow Switch (Air & water)	Johnson control/ Honeywell/ Siemens
	Miscellaneous	
100	V Belt	Dunlop/ Fenner

101	Anchor fastners	Fischer/ Hilti
102	Dash fastner	Fischer/ Hilti
103	Welding rods	Advani/ L&T
104	Flexible pipe connection	Dunlop/ Kanwal/ Resistoflex
105	Hessian Cloth (fire rated)	Navair/ Pyrogaurd
106	Vibration isolator	Resistoflex/ Dunlup/ Kanwal
107	Air Ozone	Ruks/ Trimed/ RGF
108	Fire Sealant	Birla 3M/ Hilti/ Promat
109	Adhesive / UV coating	Pidilite / Star bond

TECHNICAL SPECIFICATION OF EQUIPMENT & ITEMS IN MORTUARY

Mortuary chambers of 6 bodies shall be used for keeping cadaver under cool condition to prevent decomposition either for the purpose of conducting postmortem or before handing it over to the relatives of the dead patient.

- Mortuary should be energy efficient and capable for storing of cadaverous for long time and ensuring best hygiene
- The outer panels of all Mortuary chamber shall be of SS-304 sheets and Polyurethane foam insulation of 35mm and inner chamber shall be of Stainless steel-AISI-304. Corrosion free exterior and interior. Mortuary Chamber shall have Front opening Doors.
- The hinged doors shall be made with SS-304 sheet with PUF insulation and assembled with magnetic gasket, handle and lock arrangement & keys for each dead body. The door with Double gasket seal shall be between the door and the cabinet. Insulated glass door shall remove fogging and condensation.
- Stainless Steel (AISI-304) Tray formed of one seamless sheet for dead bodies with a tubular edge and handle at both ends.
- Mortuary Chamber shall be equipped with telescopic track system along with carriage assemblies and suitable locking arrangement.
- Equipped with refrigeration unit of sealed compressor is incorporated outside the chamber. Heavy duty Air-cooled compressor. The compressor should be of low noise level and minimal vibration.
- Condenser should have automatic condensate evaporating system.
- Non-CFC environmental friendly based on compressor capacity.
- Working Temperature +2 °C to +8° C and humidity control. Digital temperature indication.
- No Defrost required cycle required with balanced flow refrigeration system.
- Circulation Forced air circulation maintains chamber uniformity of +/-1°C and provides quick recovery
- Memory and Print options.
- UPS with constant voltage supply and 30 minutes backup
- Microprocessor controlled. Control Panel shall be placed in the front top of chambers and equipped with Microprocessor based Temperature controller cum indicator with pilot lamp, switch.
- LCD/TFT display
- Audio visual alarm for high and low temperature
- Should be Ergonomically designed “easy grip” door Handle
- Interior fluorescent lighting.

- Swivel locking castors.
- The Mortuary Chamber shall be suitable for keeping **6 dead bodies** and shall be complete with refrigeration system, locking arrangement, Foul Order Treatment by means of Activated Carbon filter for De-Odorizing System.

2. Loading Trolley-

Trolley Concealment (Hydraulic Lifting Option). Reliable and durable. Smooth rapid high/low operated from either side of trolley. Lightweight aluminum folds down sides and ends. Concealment sides and ends lower below the level of the body tray for easy side or end body transfers. Small wheel base for easy maneuverability.

Approved Makes – Bluestar/Bionics/Biomate/Acmas

TECHNICAL SPECIFICATION FOR ITEMS & EQUIPMENT OF MINOR OT

1. CEILING CONSTRUCTION

The prefabricated construction for 1.60 mm thick AISI-304 Stainless Steel backed by 12mm thick Gypsum board OR it should be Double skinned panel of 0.8mm thick 304 Grade Stainless Steel sheet each. The double skinned panel shall be sandwiched with core consisting of rigid polyurethane foam, which has been injected under high pressure, with a minimum density of 40 kg/m³. with Silicon sealant to provide seamless operating room. The individual wall panels shall use the tongue and groove technology for joining two panels, no welding should be allowed.

The ceiling suspension from concrete ceiling should be as:

Suspension elements : Suspension bracket with tension spring

Suspension Height: Continuously adjustable from 250 to 1100 mm

Stability: Permanent and non-stop after adjustment.

Material High quality galvanized steel

Providing and laying Epoxy/Antibacterial painting of 300 microns thickness over smoothly rendered surface. The treatment consists of surface preparation, priming with Primer.

2. CEILING FILTRATION SYSTEM / LAMINAR AIR FLOW SYSTEM

(Unidirectional Low Turbulence Laminar Air Flow Plenum Ceiling for each OT)

Plan air Ceiling System, standard size. PLENUM UNIT - The complete unit shall have factory prepared fine sealing system. It should be perfectly seamless integration of ceiling mounted equipment and OT Ceiling. It should be flexible modular range of solutions, adjustable to the local requirements .It should be made out of high quality and durable materials, filter housings and pressure chamber are made out of Aluminum. It should have a low pressure drop allows for the long-term usage of the HEPA miniplate H14 filters . It should have reliable filter efficiency and filters are guaranteed to remove particles and germs with the usual H14 filters retaining 99.99 % of the particles and germs. It should have minimal pressure drop a low pressure drop ensures the energy saving characteristic of the Laminar Flow Ceiling . Air & light diffuser made out of two layer of mono filament precision woven polyester for the plan air ceiling to give a "LAMINAR FLOW" of filtered air Size-8ft x 8ft. It also provides a diffused shadow less lighting system with a control on the intensity of luminance by using high frequency electronic fluorescent tubes and ballasts.

3. CORNER COVING

Extruded Aluminium powder coated/Anodized clip on type covings for the entire wall to wall and wall to ceiling. R-70, 3D internal/ external corner coves. Covering and coving

of Return air ducting lines inside OT. Material to be used for covering should be Powder coated Aluminium/SS-304.

4. WALL PAINTING

Providing and laying Epoxy/Antibacterial painting of 300 microns thickness over smoothly rendered walls. The treatment consists of surface preparation, priming with Epoxy Primer. Walls should be smoothly rendered with Wall putty.

5. DOUBLE LEAF DOOR- BOTH WAY OPENING- Size-2100 x 1500mm

44 mm thick doors made with 0.8mm thick double skinned SS-304 sheets on both sides with PUF as infill, 1.2 mm thick GPSP powder coated door frames totally flush with the wall panels, hardware like push plates, handles, door closure, double glazed view glass of std size, hinges and provision for concealed automatic door bottom Drop seal etc. Supply & Installation of double glazed view panels (1 Square ft. area) with flush design, with 6mm thick float glass fixed in double panel with necessary arrangements. Colour of the door should be as per the requirement of the client.

6. PERIPHERAL LIGHT

It should be fitted outside the air ceiling system area and flush with the ceiling in the operation theatre suitable to required illumination of OT. Peripheral lights and clean room luminaries fitted in the frame should be 8 Nos/As suitable to the required illumination (500 Lux) in numbers for each OT. The LED lamp of size 2ft.x 1ft with highly spectacular anodized Aluminum reflectors and optical antiglare system for adjustable light distribution. Luminaries cover made of highly resistant, disinfectant proof laminated safety glass with fine grained surface, glass pane with white powder coated steel frame. Luminary's body made of sheet steel, white, powder coated supplied ready for connection. The reflectors should be of high quality, cleanable and non deteriorating. Dimmable ballasts of reputed companies to be used and diffuser should be constructed with opaque acrylic diffuser material in aluminum frames/ SS frames. It should have flicker less design with color. Recess frames should be gas tight. The fitting should be flush with the ceiling and should be removable from top or bottom. Lighting units should be properly sealed with the ceiling by means of fillers and beadings so that all lighting units are airtight with ceiling panels. The light fitting should be uniformly and aesthetically distributed on the ceiling to provide uniform illumination in the OR. Peripheral lighting should be done according to IP 65 protocol. Light should not interfere when green mode of Endoscopy is performed.

7. DISTRIBUTION BOARD, ELECTRICAL WIRING, CONDUITING WITH FIXTURES INSIDE THE OPERATION THEATRE

Electrical Distribution Board along with all high voltage equipment should be installed in a separate enclosure. Transformers, Mains, Relays, Circuit protective equipment, for all circuits of Operation theatre shall be installed in the remote cabinet.

All electrical wiring should be terminated to the connectors mounted on rail and labeled with indelible labels. Individual fuse and miniature circuit breakers should protect all internal circuits. Complete schematic diagram drawing description should be enclosed with the equipment.

Laying of PVC conduits, Modular Switch Boxes, Modular Switches-sockets, Power and Light wiring including Earthing wire for all the lighting controls, Pendant and other equipment fixtures and fittings inside the theatre Wiring with low leakage current wires of FRLS wires should be as per requirements. 5/15 Amps **antibacterial switch** and socket outlet set -3 Nos shall be flushed equidistant in each wall at 325mm height from FFL of OT. Wiring for 250 volts single phase and neutral 5/15 Amps switched socket outlet with 4 sq.mm and 2.5 sq.mm PVC insulated copper conductor 1100 volts stranded flexible wires should be concealed with conduit. Installation of all electrical cabling must be of IS: 1554 (As per latest amendment) standard and wiring as per IS: 732 standard and proper earthing of OT and other accessories in the OT room as per standard guidelines of BIS. Fittings should be sealed on accordance with the standard IP54. Earthed equipotent bonding of all exposed metal work should be provided.

8. OPERATION THEATRE FLOORING (ANTISTATIC CONDUCTIVE ROLL)

The Operation theatre floor finish should be laid with 2 mm antistatic seamless conductive PVC Roll on a semi-conductive adhesive base. The floor should be scratch resistant, fire resistant, chemical resistant, non-corrosive, slip resistant, smooth, anti fungi, antimicrobial impervious material conductive enough to dissipate static electricity but not conductive enough to endanger personnel from electric shock. The joints in the flooring should be sealed by using a PVC welding bar of matching colour and hot air gun for fusion of welding bar with flooring to provide a continuous sealed surface. The conductive material should be uniformly impregnated as grains. The floor should be inert to body fluids, chemicals, detergents and disinfectants and it should not be affected by temperature variation within the OT. Colour should be uniform, pleasant and matching with ambience and should be approved by client/HSCC. **The floor finish should pass over a concealed cove former and continue up the wall for 100mm.** The floor should be provided flat to within a tolerance of ± 3 mm over any 30 Sq.mtr area. Copper grounding strip (0.05 thick, 50 mm width) should be laid flat on the floor in the conductive adhesive and connect to copper wire of grounding. The connection from copper grid should be brought out uniformly at places to form equi-potential grid. A self-leveling compound should be laid prior to laying of the floor finish. One earthing lead should be brought out of from every 150 Sq.ft. area and attaching it to main earthing strip/ground. The floor should have electrical resistance(Point to ground) within 2.5×10 to 2.5×10^6 Ohms as per NFPA-99/ DIN 51953/ATMF-150 B1 class of fire resistance. The floor should efficiently discharge electric charges upto 2 KV. The floor should not allow building up of electrical charge beyond 100 volts due to antistatic effect. It should fulfill

product requirements as per EN649. The corner should not be terminated sharply and concealed cove-former (Aluminum) upto 100mm from FFL and should be used overlap to a height of 25mm approx. and sealed perfectly and uniformly. Self-leveling compounds should be used for this purpose. Radius for corner coving- 60-70R

9. INTERNAL DUCTING

The internal ducting in the Operating theatre should be done as per ISI-655 duly fabricated out of 22 swg Aluminum sheet complete with flanges and accessories such as GI suspenders and GI supports completely sealed with Silicon sealant duly insulated with Aluminum foil and (XLPE) Polyethylene/Nitrile Rubber self-adhesive type insulation. The type of insulation and its thickness should be such that there is no sweating.

10. MEDICAL GAS LINE INSTALLATION

Oxygen, Air (Medical & Surgical), Vacuum, Nitrous Oxide and AGSS supply to Operation Theatres from the existing manifold system should be provided. The medical gas alarm system shall be installed which fully satisfies the principles of HTM 2022/NFPA.

Medical graded Copper pipes shall be solid drawn, tempered, seamless, phosphorous deoxidized, non-arsenic and degreased for oxygen service. Copper to Copper joints shall be made on site using silver-copper-phosphorous brazing alloy to BS-1845. Copper to brass or gunmetal joints shall not be made on site. Except for mechanical joints used for components, all metallic pipeline joints shall be brazed or welded. All pipelines shall be routed in such a way that they are not exposed to a temperature less than 5 deg Celsius above the dew point of the gas distribution pressure. The chemical composition shall be as per BS-6017: 1981 Table 2, Cu-DHP grade. Distribution Copper Pipe manufactured as per BSEN:13348:2008 Each pipe shall be capped at both ends before supply. Pipeline shall be supported at interval to prevent sagging.

The supply of pipes shall accompany with manufacturers test certificates for physical properties and chemical composition. The supply of pipes shall be further substantiated with inspection certificates from third party inspectors like LLOYDS/SGS/TUV.

Medical graded Copper Piping should be laid down from Pendant/Bed Head Panel/Gas Outlets of OT to the nearby Valve Box outside the Operation Theatre via Surgeon Control Panel.

11. SCRUB STATION

Compact Surgical Scrub sink -2 Bay should be designed for use in Operation theatre complex providing surgeons with a convenient sink for pre-OT scrub up. The Scrub Sink should be made of 1.5mm thick AISI-304 Stainless Steel and top surface(Counter) should be made of one piece and polished to seamless satin finish. The scrub sink should be provided with a front access panel which should be easily removed for access to the water controlled valve, waste connections, stoppers and strainers. Hands free operation should include infra-red sensors with built-in range of adjustment. Thermostatic mixing, valve control should be located behind the access panel and maintain constant water temperature. User defined time 1, 3,5,10 min. are available. This timing should be adjustable to meet individual application requirements, provided with infrared sensors, thermostatic control taps with fail-safe temperature controls. All units should have reduced anti splash front. It should have manual foot and operation mode. Knee operated switch should be provided additionally. The station should also have inbuilt soap dispensers. Scrub station should be equipped with 10L Geysers for supply of hot water.

12. X-RAY FILM VIEWER

The Two (2) plate viewing LED type/ high frequency fluorescent lamps X-Ray Viewing Screen should be designed to provide flicker free luminance for clear film viewing. Each plate should be able to illuminate films up to 14"x17" size. 'Dimming is controlled using dimming ballast and PCB mounted inside the box. The mounting of the Screen should be installed flushed with Operation theatre wall to avoid dust accumulation and microbial growth and ease of cleaning. The diffuser should diffuse the light evenly and to provide adequate luminance for film viewing. Body should be of extruded aluminum powder coated black with bacteria and disinfectant resistant finish. Proper spring loaded film clip with rollers should be provided to hold the films firmly and to remove the film without scratches. The X-Ray Film viewer should comply with relevant Electrical Safety Codes for High and Low voltage system.

13. OT LIGHT - (Imported)

Description: Dual Dome LED Surgical Lighting System

i) OT Light

Operating Room Surgical Lighting System should provide an ideal combination of brightness, Maneuverability, and shadow resolution without sacrificing color accuracy through a consistent LED technology with a unique faceted reflector design technology.

Such Lighting System should have the following technical specifications:

- Number of Light heads : : Two per suspension
- Number of LEDs : Should be adequate enough for following minimum illumination level
- Color Temperature : 3800 - 5000 K($\pm 10\%$) - Variable colour temperature.
-
- Field Size Diameter : 20 to 28cm (+/- 10%)
- Depth of Field : 750 to 1100mm (+/- 10%)
- Illumination Level : minimum 160,000 Lux each
- Controls : Wall Control Touch Panel
- Rotation : 330- 360 degrees
- Vertical Adjustment Range : + 20 inch – 25 inch
- Sterilizable Handle : 2 Nos
- Light head Diameter : 30-35/800mm \times 720mm of size
- Mounting Type : Ceiling
- Supply Voltage : 230 VAC 50 Hz
- Bulb Type : LED
- Dimming Range : 30% - 80%
- Operating/Storage Humidity : 10 – 95%
- Life of Light Source : > 40,000 Hrs.
- European CE /US FDA certified

APPROVED MAKES

1	PVC Floor	Gerfloor/Tarkett/Forbo/Polyfloor/Armstrong/Altro
2	OT LED Light	Stryker/Maquet/Trilux/Berchtold/Simeon/Danmedics/Trumf/Martin/ Evonos/Surgiris
3	Copper Pipe	Maxflow/Rajco/Precision
4	Door	Metaflex/SHD/GEZE/Rebbon/ Dorma/SHD
5	Peripheral Light (LED)	Philips/Wipro/GE/Crompton

- **Third party quality certification of the imported OT equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted as “Certifies that the imported item (Name of the equipment) meets the technical specification and BOQ of the tender document”.**

TECHNICAL SPECIFICATIONS OF ITEMS & EQUIPMENT OF BIO-MEDICAL WASTE MANAGEMENT SYSTEM

1. Bio-Medical Waste Autoclave

Horizontal Cylindrical High Pressure Steam Sterilizer BIS Mark IS: 3829 (Part 1)

Horizontal Cylindrical High Pressure Steam Sterilizer, manufactured as per BIS Specification No. IS 3829 (Part 1)-1978, with the latest amendments and bearing ISI Mark IS: 3829 (Part 1).

- **Capacity: Sterilization more than 600 Ltrs**
- Mode of Heating: Electrically heated by immersion heaters wired for operation on
- Capacity suitable to the bio-medical waste of the AIIMS for autoclave
- Working pressure: 20 Lbs/Sq.Inch. 1.26 kgf/cm².
- Operating Pressure: 1.05 + 0.15 kgf/cm² approx. (20 psi).
- Operating Temperature: about 110 & 121 degrees centigrade.
- Exhaust: Fast Exhaust within 7 minutes & slow exhaust from 7 to 30 minutes.
- Hydrostatic Test: The shell is subject to hydrostatic test to twice the working pressure.
- Performance: The sterilizer shall be capable of performing the following operations constituting one full cycle of sterilization.
 - Generate steam and build up working pressure in the jacket, without admitting it to the chamber:
 - Admit steam to the chamber and allow it to build up to working pressure and temperature.(maintaining pressure in the jacket) and retaining working temperature for at least 2 hours;
 - Exhausting the chamber pressure, retaining the jacket pressure; and
 - Drying of load in chamber (if required) through the circulation of dry filtered air entering through a drying system.
- Dished Door: Fitted with one dished door SS-316 and brass Hinges, with SS radial arms to manipulate smoothly by well-insulated handles, and shall have gunmetal Door Locking assembly & automatic pressure locking device to provide complete safety to the operating personnel against any explosive opening of the door under high pressure. Provision is made to tighten the dished door while in locked position. A molded steam and heat resisting silicone joint less gasket shall be fitted to the door.

Material of Construction:

- Chamber & Back Plate: SS sheet of grade (04Cr18Ni10 Mo02) 316 non-magnetic-10 SWG.
- Jacket: SS sheet of grade (04Cr18Ni10) 304 non-magnetic.
- End Ring: SS 304 non-magnetic

- Connections & Piping: Made of Stainless Steel having bright finish.
- Dished Door: Stainless Steel.
- Outer cover: SS sheet 304 Quality.
- Operating Valve: To Control the cycle of sterilization as per ISI standards.
- Safety Valve: As a pressure switch for controlling pressure is provided on jacket, spring-loaded safety valve is provided to jacket as a safe guard against excess pressure in the jacket.
- Ejector: A powerful ejector system to create partial vacuum, which shall help in quick drying.
- Drying System (Vacuum): With Bacteria Filter allows dry filtered hot air into the chamber during drying cycles.
- Vacuum Breaker: Prevents formation of accidental vacuum in jacket due to steam condensation.
- Plug Screen: Fitted in Chamber, prevents the Chamber from clogging with lint and sediment.
- Dial Thermometer: Indicates the working temperature in the Chamber accurately.
- Pressure Gauge: Indicates the pressure of steam in the jacket.
- Compound Gauge: Indicates the vacuum and pressure in the chamber.
- A Pocket (For Thermograph): The provision to fit the bulb for the temperature recorder.
- Steam Trap and Check Valve: Fitted into the discharge line for automatic removal of residual air and condensate to give optimum sterilization temperature.
- Boiler (Steam Generator): Fitted to underside of shell. Boiler shall be fitted with:
 - Immersion type heating elements suitable to the requirement..
 - A low water protection for heaters provided to cut off electricity supply to heaters through a float level switch and magnetic air break contactor if the water level runs below heater level. Feed water System to feed water in to the Boiler as and when water level goes down.
 - Water level gauge glass indicates level in boiler (capable of self-locking in case of breakage).
 - Water inlet with non-return valve and drain valve etc.
 - Pressure controls switch to control and keep pressure constant in the jacket.
 - Boilerplate of Stainless Steel AISI-316 & Nuts and bolts shall be of stainless steel.
 - An extra pressure gauge and safety valve is provided in the boiler.
 - In addition, equipped with Toggle Switch and indicating red & green Lamps.
- Tray (Stainless Steel): Provided in the Chamber of suitable size.
- The whole unit shall be mounted on a tubular pipe stand duly painted with best heat resisting paint.
- The unit shall be made as per I.S.I. Specification No. IS:3829 (Part 1) and bear I.S.I. Mark IS 3829 (Part 1).

- **Secondary Sterilization system should be incorporated with the Waste Autoclave for sterilization of infected steam condensate of the Waste Autoclave.**

Accessories:

- Audio Visual Alarm with Timer.
- Thermograph with 500 recording charts.
- Rack with Trays complete SS-316.
- Digital Temperature Controller with probe.
- Digital temperature indicator with 2 temperature probes.
- Water Softener Plant.
- Additional manual arrangement for filling Boiler with solution to descale boiler.

2. Medical Waste Shredder (Low Speed)

- Should be of robust design with minimum maintenance requirement.
- Should be properly designed and covered to avoid spillage and dust generation. It should be designed such that it has minimum manual handling.
- The hopper and cutting chamber of the shredder should be so designed to accommodate the waste bag full of biomedical waste.
- The shredder blade should be highly resistant and should be able to shred waste sharps, syringes, scalpels, glass vials, blades, plastics, catheters, broken ampoules, intravenous sets/ bottles, blood bags, gloves, bandages etc. It should be able to handle/ shred wet waste, especially after microwave/ autoclave/ hydroclave.
- The shredder blade should be of non- corrosive and hardened steel.
- The shredder should be so designed and mounted so as not to generate high noise & vibration.
- If hopper lid or door of collection box is opened, the shredder should stop automatically for safety of operator.
- In case of shock- loading (non- shred able material in the hopper), there should be a mechanism to automatically stop the shredder to avoid any emergency/ accident.
- In case of overload or jamming, the shredder should have mechanism of reverse motion of shaft to avoid any emergency/ accident.
- The motor should be connected to the shredder shaft through a gear mechanism, to ensure low rpm and safety.
- The unit should be suitably designed for operator safety, mechanical as well as electrical.

- The shredder should have low rotational speed. This will ensure better gripping and cutting of the biomedical waste.
- The discharge height (from discharge point to ground level) should be sufficient (minimum 3 feet) to accommodate the containers for collection of shredded material. This would avoid spillage of shredded material.
- The minimum capacity of the motor attached with the shredder should be adequate enough for carrying out for **50Kg/hr** and should be three phase induction motor. This would ensure efficient cutting of the bio-medical waste as prescribed in the bio- medical waste (Management & handling) Rules.
- Anti-vibration mounting should be provided
- Control panel should be provided with auto stop/reversing
- Emergency stop should be provided for safety
- Limit switch should be provided to switch off the Shredder if hopper lid of the door of the Collection Box is opened

3. Needle destroyer

- Should incinerate the needle using low voltage electrical current.
- It should reach a temperature of 1600-1700°C to turn the needle into ash.
- The process should be rapid taking 1-2 seconds
- There should be no visible sparking or arcing
- After incineration the needle debris should be contained in a built in receptacle/container which may be disposable or reusable
- Should have a cutter to cut the nozzle of the syringe with minimal agitation
- Should destroy or deform the needle and syringe by mechanical means
- The cutting blades should be of the best quality

4. Waste Collection Containers

The waste collection containers shall be of steel construction with synthetic enamel paint of approved colours.

The waste collection containers must have foot operated lids.

The approximate sizes of the collection containers shall be as per the BOQ

The waste collection containers should have Bio-medical hazard symbol printed on them

The colours of the waste collection containers should be as per the July 1998, Gazette Notification of Ministry of Environment & Forest for identification of category of wastes that shall be collected in to it.

5. Waste Collection Bags

The waste collection bags shall be of yellow, red and blue/white translucent colours for collection of different categories of wastes and black for collection of routine waste as per the recommendations of the Ministry of Environment and Forests in their latest gazette notification.

The yellow coloured waste collection bags for the collection of incinerable waste should be made of non chlorinated plastic so as to facilitate incineration of waste without having to open the bags

The bags of red, blue/white translucent colours should be safe for autoclaving and should be capable to withstand high temperatures and pressure during autoclaving.

All the bags must contain the Bio-hazard symbol printed on it.

The sizes of the bags should be such that the can be placed inside the waste collection containers for the collection of waste.

The bags should be supplied with non reversible locking strips at no extra cost.

6. Transportation Trolley

- The container should be made of sturdy plastic material resistant to acid, alkali and chemicals and should be constructed of suitable capacity.
- Should be designed and constructed so that they do not have sharp edges.
- Container must be detachable and there must be provision for washing the container
- Should be easy to clean, disinfect and drain.
- Should be covered with a sturdy plastic lid attached with hinges and latch facilities so that biomedical waste bags are not exposed to environment.
- Iron body frame of trolley MS angle.

- Should be able to contain any leakage from the damaged containers.
- The waste should be easily loaded, secured and unloaded.
- Should hold minimum number of bags as per the requirement.
- Should be color coded yellow/blue/white/black and have biohazard sign and name of the hospital.
- Should have four wheel drives, two wheel movable and two fixed. Should be rubber bounded to cast iron long life, high load capacity and road grip size 6 inch with sealed ball bearing.
- Should have wheel locks to prevent the wheel barrow from rolling on its own.

7. INDUSTRIAL WEIGHING MACHINE Capacity -300 Kg.

Electronic weighing machine with digital display. Electronic weighing scales of standard make to weigh upto 300 kg. The certificate from Weights & Measures Dept. is to be attached with the machine, duly certifying the serial no. complete with accessories as per specification. Make- Atco/Sanchit

APPROVED MAKES FOR BIO-MEDICAL WASTE MANAGEMENT EQUIPMENT

1	Waste Autoclave	Nat Steel/Periclave /Cecon/Reliance Instrument
2	Shredder	Alfa Therm/Cecon /Shredders & Shredding /Reliance Instrument

TECHNICAL SPECIFICATION OF CSSD ITEMS & EQUIPMENTS

CSSD EQUIPMENT

1. HORIZONTAL STERILIZER 550L-600L OR MORE WITH ACCESSORIES

Fully automatic PLC or Microprocessor controlled Horizontal Rectangular Autoclave (Steam Sterilizer), with pre and post-vacuum treatment and with loading equipment.

(a) Door:

The sterilizer supplied should be pneumatically (Compressed Air) /electrical operated double door with fully automatic vertical sliding movement along with door safety features.

Door Safety Systems:

- 1 Pressure sensor system should be available in the chamber to monitor the chamber pressure. Chamber should be completely depressurized before the door seal is retracted by vacuum.
- 2 Door chamber should not be opened when chamber is pressurized.
- 3 A mechanical safety edge stops the door if it is obstructed while closing, thus protecting operator & loading equipment.
- 4 A cycle should not start if the door is open or not properly locked and a specific indicator or display should be there if door is not locked/open .
- 5 The door seal should be made of silicon rubber gasket & on commencement of the process the door gasket is pressed against the rear face of the door by steam/air to ensure the door remains closed during the process.
- 6 Double door safety is implemented through interlocks which prevent both doors from being opened simultaneously.

- 7 The Sterilizer should be supplied with Automatic (Manual opening in case of automatic mechanism failure) vertical sliding door.

(b) Construction:

1 Chamber & Doors:

The chamber and doors should be made of solid, high quality 316L Stainless steel.

The chamber should be jacketed to ensure the temperature uniformity in chamber.

The chamber floor is slightly sloped towards an internal drain to facilitate drainage.

A stainless steel mesh strainer should be provided to protect the drain port from blockage by debris. The chamber is mounted on a stainless steel framework with height adjustable feet.

2 Surface Treatment:

The internal surface should be electro-chemically treated or mechanically treated for high quality smooth finish to facilitate cleaning. The resultant surface should be polished to less than 0.8 µm fineness to protect against corrosion. The internal corners should be rounded off to facilitate efficient cleaning.

3 Insulation:

The sterilizer jacket and door should be completely insulated to keep the autoclave cool on the outside. The insulation should be completely encased in rigid removable sheet housing.

4 Jacket:

The jacket should be made of 316L quality stainless steel with pressure gauge.

5 Steam Generator:

The sterilizer should have inbuilt steam generator of adequate capacity. In inbuilt steam generator, it should be mounted under the sterilizer chamber & should be made of 316 quality stainless steel.

The steam generator should have chloride free mineral wool/mineral glass wool of thickness 25 mm to 50 mm insulation with SS 316 or Aluminum.

It should have a built in thermostat, pressure safety valve & water level glass gauge inspection device or water level indication on screen visible from service area.

The heating element should be of sufficient capacity to make the sterilization process faster with maximum cycle time of 45-50mins in pre vacuum.

It should also have the automatic blow down valve & degassing system for feeding water to steam generator.

(c) Pipes, Valves and Components:

The piping system should be made of Stainless Steel / Brass / Copper.

All the process valves should be stainless steel or Copper Valves or Red Brass Valves & should be pneumatically/electrically operated piston valves for longer trouble free operations.

All the non-standard components should be non-proprietary & should be easily sourced.

All the hot pipes should be properly insulated. Safety valves should be made of brass/copper/stainless steel.

- 1 Primary piping & fittings should be stainless steel threaded or stainless steel triclamp fittings.
 - 2 Primary components: 316 quality triclamps or threaded fitting components like – Manual valve, non-return valve, pressure regulator, pneumatic valves, and steam trap etc.
 - 3 Electrical Components: the terminals & contacts should be housed in a water tight cabinet while the other electrical component should be directly mounted on sterilizer.
- (d) Air Filter: Air filter should be provided for filtering the atmospheric air before entering inside the chamber. The filter separation efficiency should be higher than 99.998% for particle size less than 0.3µm. Air filter should be covered under Warranty and CMC period
- (e) **Control System:**
- 1 The control system should be microprocessor based PLC system specially designed for sterilization application.
Control system should have touch sensitive, 7 inches or more colour display interface at operator loading side while it should have normal interface at unloading side
Apart from main PLC based control system the sterilizer should also have additional independent monitoring & documentation system which constantly cross checks the safety systems & time.
 - 2 Multiple password access levels (specify number) should be provided to control access/operation of the machine preventing unauthorized access.
These access levels should be user selectable. The control system should have CPU processor with battery back-up & nonvolatile memories, Digital input/output controls, analog measuring inputs & COM ports for printer & PC connectivity.
 - 3 With the standard factory configuration, calibration of the temperature circuits and calibration of the pressure circuits require an access code.
- (f) **Temperature and Pressure Sensors:**
- 1 The sterilizer should have at least 2 temperature & pressure sensors one at chamber drain & one in Jacket. It should also have temperature & pressure sensor in chamber.
 - 2 The sensors should be PT100 sensors to confirm Class A of the IEC 571 standard, with accuracy of $\pm 0.1^{\circ}\text{C}$ while the pressure sensor should have the accuracy 1% over the range of 0-5 bar.
 - 3 Each sensor circuit should be calibrated with individual constants to correct the deviation in manufacturing and aging.
- (g) **Alarms:**
Automatic process checking & failure correction should be possible by the control system.
The range of alarm should include over temperature , pressure sensor failure, phase time-out, doors not properly closed, power failure (less than 10 sec should be ignored), Continuous self-checking of all the safety devices, low water level ,water in chamber etc should be possible.
All the alarms should be audio and visual.
- (h) **Loading/Unloading system:**
Sterilizer should have the two rails for easy loading, shelf rack with shelves (carriage) with 1 set of loading and unloading trolley.
- (i) **Cycle Documentation – Printer:**
The autoclave should be equipped with an alpha-numeric Laser/thermal printer which prints the each cycle parameter performed by the sterilizer. The measured values of temperature and pressure are printed at fixed time intervals, according to various phases of the sterilization process such as 4 minute time interval for vacuum, 1 minute time interval for sterilization, and the start and end time of the drying phase.
All these time intervals should be user defined. Vendor should supply customized time intervals as desired by the user prior to order delivery.
- (j) **Water Consumption:**
Specify water consumption levels.
- (k) **Vacuum Pump:**
High vacuum pump (water ring type) with recycling facility for removal of air within the chamber should be provided & mounted on vibration isolator for quite operations.
It should also have low water level alarm to protect it from dry run.

(l) Available Cycles:

The sterilizer should be designed to operate various programs.

Apart from standard cycles, special cycle should be programmed by an authorized supervisor code only.

(m) Programs include:

- 1 Wrapped Instruments, Porous load 134°C
- 2 Heat Sensitive material, rubber, plastic, porous load 121°C
- 3 Rapid cycle for single open instrument
- 4 Heavy load cycle
- 5 Bowie & Dick test (7 Kg), PCD test
- 6 Leak test

(n) Directives & Standards:

It should meet EN ISO / IEC directives and product should be US FDA/European CE certified with four digit notified body number.

The manufacturer should have ISO 13485:2003 and EN 285 for Large Autoclaves (Europe) or USA: ST8 – Hospital Sterilizers

(o) Should pass a hollow load (A) test (Batch monitoring system).

(p) Steam Sterilizer should have provision for connecting a ¾" line terminating in the shutoff valve, non-return valve, pressure relief valve, steam riser, condensate drain and other essential accessories (for future steam connection from the central boiler).

(q) In case of suppliers offering standalone steam generator they should provide alternatives for ensuring clean steam (as per International Standards)

i With standalone generator

ii For preheating the sterilizer with steam from a central boiler having adequate stand by supply

(r) High vacuum compressor with recycling facility.

2. HIGH SPEED STERILIZER 150 -250 Litres WITH ACCESSORIES FOR TSSU:

Fully automatic PLC or Microprocessor controlled Horizontal Rectangular Autoclave (Steam Sterilizer), floor mounted with pre and post-vacuum treatment and with loading equipment.

(a) Door:

The sterilizer supplied should be supplied with automatic sliding door (electrically controlled) alternatively pneumatically controlled can be given, with door safety features.

Door Safety Systems:

- 1 Pressure sensor system should be available in the chamber to monitor the chamber pressure. Chamber should be completely depressurized before the door seal is retracted by vacuum.
- 2 Door chamber should not be opened when chamber is pressurized.
- 3 A mechanical safety edge stops the door if it is obstructed while closing, thus protecting operator & loading equipment.
- 4 A cycle should not start if the door is open or not properly locked.
- 5 The door seal should be made of silicon rubber gasket & on commencement of the process the door gasket is pressed against the rear force of the door by steam/air to ensure the door remains closed during the process.
- 6 The Sterilizer should be supplied with Automatic (Manual opening in case of automatic mechanism failure) vertical sliding door.

(b) Construction:

1 Chamber & Doors:

The chamber and doors should be made of solid, high quality 316L Stainless steel.

The chamber should be jacketed to ensure the temperature uniformity in chamber.

The chamber floor is slightly sloped towards an internal drain to facilitate drainage.

A stainless steel mesh strainer should be provided to protect the drain port from blockage by debris.

The chamber is mounted on a stainless steel framework with height adjustable feet.

2 Surface Treatment:

Surface Treatment: The internal surface should be electro-chemically treated or mechanically treated for high quality smooth finish to facilitate cleaning. The resultant surface should be polished to less than 0.8 µm fineness to protect against corrosion. The internal corners should be rounded off to facilitate efficient cleaning.

3 Insulation:

The sterilizer jacket and door should be completely insulated to keep the autoclave cool on the outside. The insulation should be completely encased in a rigid removable sheet housing.

4 Jacket

The jacket should be made of 316L quality stainless steel with pressure gauge.

5 Steam Generator:

The sterilizer should have inbuilt steam generator of adequate capacity. In inbuilt steam generator, it should be mounted under the sterilizer chamber & should be made of 316 quality stainless steel.

The steam generator should have chloride free mineral wool/mineral glass wool of thickness 25 mm to 50 mm insulation with SS 316 or Aluminum.

It should have a built in thermostat, pressure safety valve & water level glass gauge inspection device or water level indication on screen visible from service area.

The heating element should be of sufficient capacity to make the sterilization process faster with maximum cycle time of 45-50mins in pre vacuum.

It should also have the automatic blow down valve & degassing system for feeding water to steam generator.

(c) Pipes, Valves and Components:

1 Pipes, Valves and Components:

The piping system should be made of Stainless Steel / Brass / Copper.

All the process valves should be stainless steel or Copper Valves or Red Brass Valves & should be pneumatically/electrically operated piston valves for longer trouble free operations.

All the non-standard components should be non-proprietary & should be easily sourced.

All the hot pipes should be properly insulated. Safety valves should be made of brass/copper/stainless steel.

2 Primary piping & fittings should be stainless steel threaded or stainless steel triclamp fittings.

3 Primary components: 316 quality triclamps or threaded fitting components like – Manual valve, non-return valve, pressure regulator, pneumatic valves, and steam trap etc.

4 Electrical Components: the terminals & contacts should be housed in a water tight cabinet while the other electrical component should be directly mounted on sterilizer.

(d) Air Filter:

Air filter should be provided for filtering the atmospheric air before entering inside the chamber.

The filter separation efficiency should be higher than 99.998% for particle size less than 0.3µm.

Air filter should be covered under Warranty and CMC period

(e) Control System:

1 The control system should be microprocessor based PLC system specially designed for sterilization application.

Control system should have touch sensitive, 7 inches or more colour display interface at operator loading side while it should have normal interface at unloading side.

Apart from main PLC based control system the sterilizer should also have additional independent monitoring & documentation system which constantly cross checks the safety systems & time.

2 Multiple password access levels (specify number) should be provided to control access/operation of the machine preventing unauthorized access.

These access levels should be user selectable. The control system should have CPU processor with battery back-up & non-volatile memories, Digital input/output controls, analog measuring inputs & COM ports for printer & PC connectivity.

3 With the standard factory configuration, calibration of the temperature circuits and calibration of the pressure circuits require an access code.

(f) Temperature and Pressure Sensors:

- 1 The sterilizer should have at least 2 temperature & pressure sensors one at chamber drain & one in Jacket. It should also have temperature & pressure sensor in chamber.
 - 2 The sensors should be PT100 sensors to confirm Class A of the IEC 571 standard, with accuracy of $\pm 0.1^{\circ}\text{C}$ while the pressure sensor should have the accuracy 1% over the range of 0-5 bar.
 - 3 Each sensor circuit should be calibrated with individual constants to correct the deviation in manufacturing and aging.
- (g) **Alarms:**
Automatic process checking & failure correction should be possible by the control system. The range of alarm should include over temperature , pressure sensor failure, phase time-out, doors not properly closed, power failure (less than 10 sec should be ignored), Continuous self-checking of all the safety devices, low water level ,water in chamber etc should be possible. All the alarms should be audio and visual.
- (h) **Loading/Unloading system:**
Sterilizer should have the two rails for easy loading, shelf rack with shelves (carriage) with 1 trolley.
- (i) **Cycle Documentation – Printer:**
The autoclave should be equipped with an alpha-numeric Laser/thermal printer which prints the each cycle parameter performed by the sterilizer. The measured values of temperature and pressure are printed at fixed time intervals, according to various phases of the sterilization process such as 4 minute time interval for vacuum, 1 minute time interval for sterilization, and the start and end time of the drying phase.
All these time intervals should be user defined. Vendor should supply customized time intervals as desired by the user prior to order delivery.
- (j) **Water Consumption:**
Specify water consumption levels.
- (k) **Vacuum Pump:**
High vacuum pump (water ring type) with recycling facility for removal of air within the chamber should be provided & mounted on vibration isolator for quite operations.
It should also have low water level alarm to protect it from dry run.
- (l) **Available Cycles:**
The sterilizer should be designed to operate various programs.
Apart from standard cycles, special cycle should be programmed by an authorized supervisor code only.
- (m) **Programs include:**
- 1 Wrapped Instruments, Porous load 134°C
 - 2 Heat Sensitive material, rubber, plastic, porous load 121°C
 - 3 Rapid cycle for single open instrument
 - 4 Heavy load cycle
 - 5 Bowie & Dick test (7 Kg), PCD test
 - 6 Leak test
- (n) **Directives & Standards: Directives & Standards:**
- 1 It should meet EN ISO / IEC directives and product should be US FDA/European CE certified with four digit notified body number. The manufacturer should have ISO 13485:2003 and EN 285 for Large Autoclaves (Europe) or USA: ST8 – Hospital Sterilizers
- (o) Should pass a hollow load (A) test (Batch monitoring system).
- (p) High vacuum compressor with recycling facility.

3. RAPID STERILIZER (FLASH AUTOCLAVE)TABLE TOP STERILIZER WITH ACCESSORIES FOR TSSU

- 1 Sterilizer Type: Table Top Sterilizer
- 2 Capacity: minimum 20 L
- 3 Chamber Size: The sterilizer should have Circular or Rectangular chamber.

- 4 Quality System Compliance: Sterilizer should comply the quality systems as per ISO 9001:2000/ EN ISO 13485:2003/ ISO 14001:2004.
- 5 Quality Standards: Sterilizer should be US FDA/European CE certified with four digit notified body number
- 6 Types of Cycles Process: Table Top Sterilizers should be equipped with B-process, N process as per latest EN 13060 . Proof of declaration of conformity.
- 7 Chamber: Should be made of S.S.316 & should comply the Pressure Equipment Directive (PED) &EN 13445 norms. Chamber should have working pressure 2.2 bar & design pressure upto 3.8 bar. Chamber should be equipped with electrically heated jacket for preheating on standby mode.
- 8 Door Design: Should have radially opening door with at least one or two locking bolts for enhanced door safety. The doors should come with silicon elastomeric rubber gasket to withstand temperature upto 140°C & 20-30 psi.
- 9 Air Filter: Air filter should be provided for filtering the atmospheric air before entering inside the chamber. The filter separation efficiency should be higher than 99.998% for particle size less than 0.3µm. Air filter should be covered warranty & CMC period
- 10 Cycle programs:
 - 134°C Wrapped.
 - 121°C Wrapped.
 - 134°C Flash/Rapid open instrument cycle.
 - 134°C Textile.
 - Test programs : Bowie & Dick, Leak Test.
- 11 Water Storage Tank: Sterilizer should have inbuilt water reservoir with storage capacity up to 5 L. The water reservoirs should have easy access for cleaning & to avoid bio film.
- 12 Steam Generator: Sterilizer should have inbuilt steam generator .The steam generator design should be with integrated energy storing system for building up power for sterilization loads in short time.
- 13 Control Panel: The control system should be microprocessor based PLC system specially designed for sterilization applications. The control system should have CPU processor with battery back-up, Digital input/output controls, analog measuring inputs & COM ports for printer & PC connectivity.
- 14 Alarms: Automatic process checking & failure correction should be possible by the control system. The range of alarm should include Temperature & pressure sensor failure, phase timeout, doors not properly closed, power failure (less than 10 sec should be ignored), continuous self-checking of all the safety devices, low water level etc. All the alarms should be audiovisual.
- 15 Accessories: The sterilizer unit should include rack with 3 or more levels & suitable size instrument trays should be the part of the supply for every sterilizer. The Sterilizer should have water circulation system so that no drain point & fixed water inlets required
- 16 Electrical Requirement: 230V & 50 Hz electric supply.

4. DOUBLE DOOR WASHER DISINFECTOR 300-350 Litre WITH ACCESSORIES

- a The washer disinfectant shall be suitable for cleaning and disinfection of surgical instruments/goods. The process shall include pre wash, detergent wash and hot water disinfection, rinse and drying cycles.
- b The unit shall be suitable for electrical operation and would be complete with water circulation pump, necessary valves & fittings.
- c It should be microprocessor based so as to ensure correct program sequence and irregularities or deviations which are displayed immediately.

- d Chamber Capacity: Chamber capacity: Operational Volume should be 300 to 350 L. Should supply 12 Nos of standard Stainless Steel DIN trays. It should also be able to process minimum 12 DIN trays (Approx 480X250X50) in single process. The chamber should be made of S.S. 304 or S.S. 316L quality with electro polished washed surfaces. The chamber edges should not have the pockets & folds so as to avoid bacterial growth. The wash chamber should also be fitted with bright light for clear visibility of the washing process. Chamber dimension should suit the capacity
- e Consumables required for initial start up and training should be supplied as standard
- f Consumables for 500 cycles to be quoted separately and it will be considered for price evaluation
- g Connection with MGPS system for compressed air(if required) shall be the responsibility of the bidder.

Washer should have following features:

- a For shortest possible filling and draining phases, higher capacity quick opening valves should be used so that short total process time is achieved. The design should focus on saving the environment through reduced consumptions of all utilities.
- b Cleansable spray arms should be located at the top and bottom of the chamber.
- c Wash carts should be equipped with cleansable spray arms between each shelf so as to facilitate water to reach all the surfaces which needs to be cleaned.
- d Injection wash carts should be automatically connected to water and drying air in order to clean and dry the inside of the tubular instrument.
- e The drying air should be pre-heated.
- f The washer should be equipped with independent temperature monitoring and validation test port.
- g Data interface RS232 should be available.
- h All electrical components should be easily accessible for easy service - ergonomic design.
- i Washer should be equipped with audible alarm that alerts if error code occurs.
- j Double door should be made of toughened glass for see through & should facilitate the loading process.
- k The washer should have 3 dosing pump (detergent, alkaline & lubrication) for process chemicals, instrument lubricants/ enzymatic cleaners
- 1 The washer should perform: .**
 - a Pre-rinses with cold water.
 - b Main washes with hot water (60C) and detergent
 - c Final rinse with water (55C)
 - d Disinfection with hot water (85C)
- 2 Unit to have LCD display and operating console to have membrane key pad for durability or LCD touch screen display**
- 3 Unit should feature safety measures such as:**
 - a Automatic door lock.
 - b Automatic temperature regulation.
 - c Electronic adjustment of water level.
- 4 The unit should also have an interface as standard for an optional batch printer.**
- 5 The washer disinfectant shall be supplied with universal rack, 4 level racks for instrument tray, full size instrument tray as well as stop valves, anti-suction device and plastic water trap.**
- 6 Should ensure essential washing accessories.**

7 Standards & Norms:

Should be US FDA/European CE certified with four digit notified body number.
Manufacturer should be ISO 13485:2003/ EN ISO15883/ISO9001

5. PLASMA/ H₂O₂ /LOW TEMPERATURE STRILIZER (Double door)-120-150 L

1 Sterilizer process should be suitable for sterilization of medical devices like flexible endoscopes, rigid endoscopes- both single channel and also dual channel and non lumen, metal, non metal heat & moisture sensitive instruments, like defib paddles etc. The sterilizer process must have maximum

material device manufacturers' recommendations from major endoscopic equipment manufacturers.

2 Should provide simple and fast sterilization of medical devices at low temperature using Hydrogen Peroxide sterilization gas/plasma technology without any need to have additional Dryer. 3 Sterilizer must be having US-FDA/European conformity. 4 Usable Rectangular chamber having volume of minimum 120L-150 liters. 5. Should have removable shelf for keeping big load with double microprocessor controlled door. 6 Sterilization temperature should not be more than 50 deg C \pm 5 deg C. 7 Should have minimum two / maximum three selectable pre programmed sterilization cycles for different types/ quantity of lumen and non-lumen loads with max. sterilization time not more than 55 min. \pm 5 min. 8 Should be environment friendly and have no toxic by products or harmful residues and should approval of EPA to guarantee its non-harmful feature. 9 Should have inbuilt Printer and touch screen color LCD display for controlling & monitoring the sterilization process. Should have facility to store/upload data on Ethernet/USB post for sterilization cycle records for recall & printing. 10 Should be easy to install without any civil/ plumbing work and should be mobile on wheel for each movements. 11 Sterilization should be validated using US-FDA/European CE approved Chemical Indicators and Self Contained Biological indicators with 24 hour read out time. 12 Should be able to run on Electricity 50 Hz three phase meeting IEC-60601-1-2 :2001 General Requirements of Safety for Electromagnetic Compatibility or should comply with 89/366/EEC; EMC-directive. 13. Each Sterilizer should be supplied complete with accessories like One no. six Vial incubator(220V), 6 no.s instrument trays of three different sizes with Lids. 14. Should quote same make consumables having EPA-US/ CE as mentioned below : a H2O2 Sterilant 59% - Cassette or Cup= for 100 load cycles, b Chemical Indicator Strip (for putting inside single item packs)= 2000 strips (for approx.. 100 load cycles), c Biological Indicator Vials = 100 no.s

6. . ULTRASONIC CLEANER (40 L)

- a The units should be a compact free-standing bench model, with a built-in tank manufactured from high-quality (316/304) stainless steel and a solid-state generator that sends ultrasonic (approx 40 KHz) impulses through wash water containing detergent and electrical heating; microprocessor controlled display with memory time and temperature functions.
- b The electrical energy should be transformed into sound waves by transducers, fixed to the bottom of the tank.
- c The tank should be made of solid stainless steel (316/304).
- d The ultrasonic cleaner should have a display and control which could be easily seen and placed above any liquid for safety and reliability.
- e It should have digital read out timer and temperature setting (temperature adjustable from 30 to 69 °C or more) monitoring.
- f Capacity should be 40 L
- g Should work on 230V, 50 Hz AC Supply.
- h Ultrasonic cleaner should be US FDA/European CE certified with four digit notified body number.
- i Ultrasonic cleaner should supplied with Wire mesh basket of suitable size & Stainless steel lid

7. HEAT SEALING MACHINE

1. Rotary heat sealers should provide validated sealing of sterilization bags and clear-view pouches (paper/plastic laminate). 2. It should be microprocessor-controlled. 3. The rotary heat sealer should give documentation of process parameters via an integrated printer and could be integrated with documentation system. 4. The ergonomically design should be tilted forward for increased user convenience and space saving installation. 5. The sealer housing should be powder-coated and the control panel is of the flat-membrane type, for easy cleaning. 6. It should be operationally simple. When a bag is fed into one side of the machine, the machine should start automatically or by pushing a button, moving the bag through the machine, and applying pressure and heat to form a perfect seal. 7. The warm-up time should not exceed 30 seconds. 8. The temperature should be adjustable from 50–200°C with a tolerance of 1% of the set value. 9. It should be regulated by a heating element that is highly sensitive to temperature fluctuations, assuring even temperature

and perfect seals. 10. It should offer a number of additional features, including: a) Automatic start-up b) Reverse feed function in case an instrument accidentally enters the sealing area c) Energy-saving stand-by mode d) Pre-set temperatures e) Re-settable counter function 11. Rotary heat sealers come with a port and cable for connection of the sealer to a PC and printer, enabling monitoring and documentation of the entire process. 12. Should have a protection mechanism against overheating and start prevention at temperature deviations outside +/- 5° C tolerance. 13. It should be able to produce atleast 800 pouches/hour. 14. Rotary heat sealer should be European CE /US FDA certified. 15. It should complies & validated with EN ISO 11607-2. 16. It should be of the same manufacturer as sterilizer and washer disinfectant.

8. DRYING CABINET

1. Should be automatic in operation 2. Inner chamber should be made up of stainless steel and outer chamber should be of epoxy painted CRCA sheets 3. Should have heaters of minimum 2 KW 4. There should be provision for setting the drying temperature and drying time. 5 **Capacity-275L** 6. **Should be of the same manufacturer of the sterilizers and washer disinfectant.**

2. SPRAY GUN RINSER

1. Spray gun rinse unit should be designed for connection to water or compressed air, to use for assisted cleaning of pipettes, catheters, cannulas, syringes etc. 2. The spray-gun should include tubing and different tips and nozzles for the various cleaning purposes, like a) syringes and cannulas with Record cone b) Measuring and blood pipettes c) Catheters and small pipes d) Drainage tubing e) Syringes and cannulas with Lure cone f) Spray jet for rapid instrument cleaning g) Bottles and Erlenmeyer flasks h) Water jet pumps for suction cleaning i) All appliances are stored within easy reach on a special wall-mounted rack (included). 3. A special wall-mounted rack should be a part of standard supply to store all appliances within easy reach. 4. All tips should be able to get easily locked to the spray gun by a safety cone. 5. The gun grip is heat-insulated. The water/air pressure is released, regulated and fully controlled by the spray-gun trigger (adapted to a 1/2" connection). 6. Bidder should provide complete details of sets of standard and optional adapters, nozzles and accessories.

10. GAUZE CUTTING MACHINE

1. Should be useful in cutting thickest of cotton gauze material 2. Should consist of a cutting unit and a knife sharpening unit 3. Blade size should be approx. 200 mm. 4. Bidder should have ISO 9001,ISO 13485 and ISO18001. 5. Cutting Capacity should be 165 mm. 5. Should work on 230V, 50 Hz power supply.

11. AIR COMPRESSOR

- a. The air compressor of shall be multistage stage, fully automatic suitable for delivering dry compressed air.
- b. Motor and capacity: Suitable to the requirement.

12. INSPECTION LAMP WITH MAGNIFIER

Should have two spring balanced arms with parallel movement of at least 150 degree in horizontal plane. 2. Magnifying lens should be of fixed 7 diopter bi-convex. 3. Lens diameter should be approximately 12.5 cm

13. WASH STATIONS WITH 2 SINKS FOR DIRTY AREA

1. Size Approx. (LxWxH) : 2000x900x700 mm (whd) with sink sizes of 40X500X250mm (wdh).
2. Storage cabinet should be there.
3. Water shower/water spray gun should be attachable.
4. Air Gun should be attachable.
5. Bidder should have ISO9001, ISO13485, ISO18001.
6. Should be made of solid, bright-polished stainless steel (304) to withstand heavy-duty work with wet instrument.
7. Designed with a 60 mm high edge (splash back) at the rear.

8. The front and side edges are reinforced and widened to 49 mm. Edges are welded together and polished at the corners.
9. The worktop should slope to the sink, and reinforced by a full-length support frame.
10. Sink units should be of sizes that allow processing of the large modular instrument trays.
11. The legs should be able to provide strong support and hold to the entire unit securely.
12. The sink should include a drain valve, removable strainer, manually operated drain-valve, overflow drainpipe and water trap. The table also includes a mixing faucet with swivel spout, for cold and hot water connection.
13. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.
14. Bidder should be ISO 9001 and ISO 18001 certified.

14. WORK TABLE

1. Size Approx. (LxWxH) : 1200x650x900 mm approximately.
2. Stainless steel tables specially designed for inspection and sorting of wet goods in heavy-duty areas and for general purpose pre-storage.
3. The work tables should have a rigid stainless steel construction which is easy to clean and should not have sharp edges or corners.
4. The table should be ergonomically worked up, should have easy to clean robust matt-finished (to reduce reflection of light from the surface) with minimum sheet thickness of 1.5 mm stainless steel (304) worktop/surface to withstand and carry out heavy work comfortably, either sitting or standing.
5. They are welded together and polished at all corners for good hygiene, as well as for the comfort and safety of the staff.
6. The worktop should be supported by a complete assembly with full-length reinforcements along the front, back and ends, welded together at the corners.
7. It should be delivered ready for assembly.
12. All edges should be smooth and the rigid frame should be made up of minimum 1.5 mm sheet thickness stainless steel (304).
8. There should be unobstructed access to the working space, since the only supports needed along the front of the table are the corner legs. This also facilitates cleaning of floors.
9. Bidder should be ISO 9001 and ISO 18001 certified.
10. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

15. CONTROL & PACKING TABLE WITH TWO SHELVES FOR CLEAN AREA

1. Size (LxWxH) : 2000x1400x1400 mm approximately.
2. This table should be specially designed for sorting, inspection, functional control and packing of various sets for wards, clinics etc. and for surgical instrument sets in trays. The work could be done comfortably, either sitting or standing.
3. The worktop should be made of a robust wood-based core material, surfaced with plastic laminate in a soft beige colour that reduces reflection of light from the surface. All edges should be smooth. The extended width of the worktop should be designed to facilitate thorough inspection of instrument trays and allow the use of large wrapping material.
4. The rigid frame is made of stainless steel (304).
5. There should be unobstructed access to the working space, since the only supports needed along the front of the table are the corner legs. This also facilitates cleaning of floors.
6. Should have double workspace. One workplace table should have 700 mm wide worktop and other workplace should have 1400 mm worktop.
7. The table should include a two-shelf console, mounted on the worktop, for storage of packaging materials. The rigid supporting columns of the console include 3 electrical outlets.
8. There should be a free space of 450 mm between the lower shelf and the worktop, and 150 mm between the two shelves.
9. The table should have a drawer unit (both sides as double model) mounted under the worktop.
10. Each drawer unit should be 400 mm wide and should include a drawer and a sliding plate.
11. Fluorescent tube fittings (Inspection lamp) should be available.

12. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

16. LINEN FOLD TABLE FOR CLEAN AREA

1. Size 2000x1400x900mm
2. The table should be specially designed for sorting, inspection (each piece of linen can be moved over an illuminated inspection panel) and folding of surgical dressing sets and individually packaged towels/gowns. The extended width also facilitates work with large dressing sheets. Work can be carried out comfortably, either sitting or standing.
3. The worktop should be made of a robust wood-based core material, surfaced with plastic laminate in a soft white colour that enhances the lighting for inspection of linen.
4. All edges of the worktop should be smooth.
5. The top should have a built-in opalescent (milky) plastic surface plate, 1000 x 600 mm, illuminated from underneath by two 25 W fluorescent tubes located beneath the top in a laminated recess.
6. The table should have two electrical outlets (one on each side).
7. The rigid frame should be made of stainless steel (304).
8. There should be unobstructed access to the working space, since the only supports needed along the front of the table are the corner legs. This also facilitates cleaning of floors.

17. WIRE STORAGE SHELF MODULE FOR DIRTY/CLEAN/STERILE AREA

1. Size as per design.
2. Construction should be based on single free-standing shelf modules for storage of clean linen, instruments, and packing material or sterilized goods, including disposables.
3. Moreover, two single modules can be placed back to back and combined as a double module unit.
4. If two units are to be connected, 10 S-hooks should be supplied.
5. The wire construction should allow good air circulation while permitting easy inspection of the goods.
6. The wire shelves should be made of special heavy-duty steel (304), chromium-plated and surface treated with clear epoxy varnish to facilitate cleaning.
7. The shelf unit should be easy to assemble on site and all parts should fit precisely.
8. Shelves should be mounted by means of plastic clamps onto circular rigid posts, with the adjustable height within a range of about 50 mm. Each post should include a height adjustable foot.
9. Each unit should include 5 shelves.
10. The shelf unit should have optional \varnothing 125 mm castors for using as a mobile storage unit by replacing the foot with castors.

18. PASS BOX

1. Area : Dirty to Clean, Clean to Sterile & Sterile Issue.
2. Size : 600x600x600mm, internal.
3. Should be made up of SS 304 sheets with double wall construction
4. Should have door interlocking to prevent simultaneous opening of both the doors.
5. Should have toughened glass paneling for easy visibility.
6. Bidder should be ISO 9001 and ISO 18001 certified.
- 7.. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

19. CLOSED TRANSPORT TROLLEY FROM STERILE STORE TO OT

1. Size: 1400x750x1260 mm (LxWxH) (External) approximately.
2. A Closed Transport trolley is used for sterile goods handling, for which higher protection than normal dust protection is required, e.g. short transports between hospital buildings. Suitable for handling baskets or containers with a total capacity of 9 STU (1 STU = 600 x 300 x 300 mm) on three solid, removable shelves (3 x 3 STU).

3. Trolley should be fitted with large stainless steel wheels (Ø 160 mm) for easier maneuverability.
4. Should have two fixed and two swivel wheels with brakes.
5. Should be of fully welded stainless steel construction (minimum 18 gauges, 304).
6. The doors should open 270° for easy access and cleaning.
7. Trolley should have lockable doors and should include handlebars.
8. Bidder should be ISO 9001 and ISO 18001 certified.
9. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

20. TABLE TROLLEY FOR DIRTY/CLEAN/STERILE AREA

1. Size: As per design.
2. The table trolley should be made up of SS.
3. The trolley should have handlebars.
4. The solid top and bottom shelves are made of heavy gauge stainless steel (304) with a ground and polished finish, and with a 12 mm raised edge all around.
6. The table trolley has 4 swivel wheels, mounted in ball bearings, for easy handling even in narrow passages.
7. Bidder should be ISO 9001 and ISO 18001 certified.
8. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

21. MODULAR STERILIZING BASKETS BIG

1. Size : 585x395x195 mm approximately.
2. Area : Various movement
3. It should be modular design with standard SPRI sizes and high precision and should be designed for sterilizing / processing as well as easy handling and management of the supply, storage and distribution of re-circulated sterilized goods.
4. It should be self-drying after disinfection in hot water (min.+85°C)
5. It should be sturdy, jig-welded trays maintain their size and shape even if handled carelessly.
6. It should be both nest able and stackable There should be special wire support to help making baskets both stackable (when the supports are folded into the basket) and nest able (when the supports are folded out)
7. The top frame should be designed such that it should serve as a handle grip for easy carrying even when heavily loaded.
8. There should be no sharp edges or wires.
9. The surfaces should be smooth to assure easy cleaning in a washer-disinfector.
10. The baskets should be made of electro-polishes heavy-duty stainless steel (304) and should have a rigid bottom frame that gives space for airing between goods and work surfaces and allow use on roller belt and chain conveyors.
11. It should be designed and manufactured in accordance with high quality specifications to assure long lifetime.
12. Bidder should be ISO 9001 and ISO 18001 certified.
13. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

22. MODULAR STERILIZING BASKETS MEDIUM

1. Size : 585x395x100 mm approx.
2. Area : Various movement
3. It should be modular design with standard sizes and high precision and should be designed for sterilizing / processing as well as easy handling and management of the supply, storage and distribution of re-circulated sterilized goods.
4. It should be self-drying after disinfection in hot water (min.+85°C)
5. It should be sturdy, jig-welded trays maintain their size and shape even if handled carelessly.
6. It should be both nest able and stackable There should be special wire support to help making baskets both stackable (when the supports are folded into the basket) and nest able (when the supports are folded out)
7. The top frame should be designed such that it should serve as a handle grip for easy carrying even when heavily loaded.

8. There should be no sharp edges or wires.
9. The surfaces should be smooth to assure easy cleaning in a washer-disinfector.
10. The baskets should be made of electro-polishes heavy-duty stainless steel (304) and should have a rigid bottom frame that gives space for airing between goods and work surfaces and allow use on roller belt and chain conveyors.
11. It should be designed and manufactured in accordance with high quality specifications to assure long lifetime.
12. Bidder should be ISO 9001 and ISO 18001 certified.
13. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

23. BASKET RACK:

1. Should be suitable for keeping 20 Baskets
2. Should be mounted on Bullet feet legs
3. Should be made up of Stainless Steel.
4. Should be provided with handle for easy transport.
5. Bidder should be ISO 9001 and ISO 18001 certified.
3. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

24. STORAGE RACK:

Size – 1830X535X1830

5 shelves; Made of Stainless Steel-AISI-304, Finished with Polishing with bullet feet

Bidder should be ISO 9001 and ISO 18001 certified.

Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

25. STAFF CHAIR

1. Should be medium Back chair
2. Should rest on high quality 50mm castors on 4 legs with cross reinforcement for sides with arm rest and foot stumps of PVC
3. Should have seamlessly upholstered seat and backrest, washable antimicrobial with poly foam cushion.
4. Colour of base should be black.
5. Should be height adjustable, broad, padded.
6. Should have upholstered arm rests and comfortable back rest.
7. Bidder should be ISO 9001 and ISO 18001 certified.
- 8.. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

26. LAB STOOL WITHOUT BACKREST.(SS-304)

1. Should have stainless Steel top
2. Should be height adjustable from 450mm to 680 mm, through mild steel threaded screws
3. Should have four legged base made of 25mm steel tube mounted on rubber shoes.
4. Should have Stainless steel ring for footrest.
5. Should be pre-treated Epoxy powder coated frame work.
6. Bidder should be ISO 9001 and ISO 18001 certified.
- 7.. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

27. STORAGE CUPBOARD

1. Dimension should be as per design.
2. Material should be SS.
3. Should be provided with lockable doors.
4. Bidder should be ISO 9001 and ISO 18001 certified.
5. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

28. WASTE BIN PEDAL OPERATED-SS

1. Should be made up of high quality stainless steel. 2. Should have minimum capacity of 5 liters. 3. The covering lid should be open able by pressing the plate attached to the bottom.

29. CHANGE LOCKER -4 COMPARTMENTS

1. Change locker should have 4 compartments.
2. Should have 2 lockers at bottom and 2 at top.
3. Size of each compartment should be as per design.
4. Should be of MS
5. Should be pretreated and epoxy powder coated.
6. Bidder should be ISO 9001 and ISO 18001 certified.
7. Manufacturer should be ISO9001, ISO 13485 certified.

30. VISITORS CHAIR

1. Visitors chair should be ergonomically designed, sturdy and of good quality.
2. Should have comfortable seating and low back support.
3. Should have padded seats with anti-microbial upholstery of leather finish.
4. Should be with arm rests and fixed height.
5. Should have frame of MS tubing, multiple pretreated and finished with epoxy powder coating.
6. Bidder should be ISO 9001 and ISO 18001 certified.

31. OPEN STORAGE RACK

1. Open racks should be made of stainless steel -304
2. Should be highly durable, and should have narrow holes for allowing ventilation.
3. Should be water resistant, disinfectant resistant and rust proof.
4. Should be provided with lockable castors
5. Dimensions as per design.
6. Bidder should be ISO 9001 and ISO 18001 certified.
7. Manufacturer should have ISO9001, ISO18001, ISO13485 and ISO14001.

32. OFFICE TABLE

1. Should be wooden executive office table.
2. Should be high quality, aesthetic and ergonomic design.
3. Top should be made of pre laminated, of high density pressed wood, properly treated.
4. Should be flame and water retardant. Lipped on all sides
5. Should have an option for placing keyboard of computer
6. Should have one shelf on left side
7. Size should be as per design.
8. Bidder should be ISO 9001 and ISO 18001 certified.

33. SHOE RACK

1. Shoe rack to keep 12 pair of shoes.
2. Should be made up of MS powder coated rack with 4 tiers.
3. Should have length, breadth and depth to keeps shoes of all standard sizes.
4. Bidder should be ISO 9001 and ISO 18001 certified.

34. PAPER DISPENSING TROLLEY

1. Should be movable trolley for storing four different sizes of sterilizing wrapping paper sheets should be made of stainless steel tube.
2. Should have four ball bearing rubber wheels, of which two wheels should be equipped with brakes.
3. Bidder should be ISO 9001 and ISO 18001 certified.

In addition to the above, the contractor should visit the site any Civil, Plumbing, Electrical works required for satisfactorily functioning of the CSSD systems shall be carried out by the contractor and no extra payment on this account will be made.

APPROVED MAKES FOR MAJOR EQUIPMENT OF CSSD

Getting/Steris/Matachana/Steelco/CISA

- **Third party quality certification of the CSSD equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted by the contractor as “Certifies that the CSSD equipment to be supplied/supplied for installation meet the technical specification and BOQ of the tender document vide contract No (Mention Contract No).”**

TECHNICAL SPECIFICATION OF ITEMS & EQUIPMENT OF INTEGRATION AND DATA MANAGEMENT SYSTEM FOR OT

Detail features of integration are as under:

1. DIGITAL DISPLAY MONITOR

- 1.1 Should have 2 nos. monitors 26"-32".
- 1.2 Monitors should be high-definition medical graded flat panel LED color screen
- 1.3 Monitor 1 should be mounted on a boom arm ceiling suspended spring arm, Monitor 2 shall be placed on surgical pendant, prewired with fiber optic cables and video cables.

Both Monitors on boom arm will enable greater movement and placement of the Monitors in the line of sight of Surgeon and Assistants and will improve viewing capability and ergonomics of the OT.

2. AUDIO-VISUAL COMMUNICATION SYSTEM

- 2.1 The operating rooms should be connected to the Conference room for video conferencing and live transmissions. Fibre Optic cable should be laid accordingly.
- 2.2 Audio – Video system comprising of Room camera, Endoscopy camera, Overhead camera, Archiving System, Auxiliary devices like C-Arm, video Microscope, Mobile ultrasound etc and output devices shall be integrated with VC system. VC should be compatible to the audio video system and output devices. Also the signal compatibility with the integration system is mandatory.

The Audio/Video Router system should have the minimum following outputs. The router should be having 12x12 Digital and upgradable to 18x18 (DVI-I) with open architecture and upgradable to future input / output requirements. The routing system should be able to integrate HD signal (e.g. Room Camera) inside OT. The routing system should be able to integrate HD signal (e.g. Room Camera) inside OT. The routing system should be able to integrate the 4K, 3D and HD signal (e.g. Room Camera) inside OT. Each OT should have its independent Router system and independent Video Conferencing System.

S. No.	I/P (Source)	Signal Type	Output (Destination)
1.	Endoscopic Camera	DVI/HD-SDI	DVI Monitor -1
2.	In-Light Camera	DVI	Monitor -2
3.	Room Camera	HD DVI(Video)	Conference Room

		Conference system)	
4.	C-Arm	DVI	Monitor – 3
5.	Navigation System	DVI (Video Conference system)	Archiving System
6.	Microscope	DVI	Monitor -I
7.	Patient vital sign	DVI/VGA	Spare
8.	Archiving System-1	DVI	Spare
9.	Free for Future Use	DVI	Spare
10.	Free for Future Use	DVI	Spare
11.	Archiving System-II	DVI	Spare
12.	Conferencing Solution	DVI	Spare

4K routing and archiving technology for transmission and acquisition of surgical videos and images to achieve superior surgical outcomes and train the students to understand the deep and complex anatomical structures, clearly. 4K Video and images are to be transmitted on SDI format.

The routing system should allow selection of multiple views for simultaneous transmission in QUAD or PIP format. PACS dedicated PC has to be provided in each OT for suitable system to receive and transmit the PACS from OT.

Two loudspeakers shall be installed within the Operating room. 3-Channel Loudspeaker with Digital volume control and Audio mixer and Audio equalizer should be installed at a most suitable place. Wired speaker should be offered.

A pair of high quality echo cancellation active loudspeakers shall be installed within the Operating room along with wireless Mic. Suitable HD-SDI/ Fiber cable material and a patch panel should be offered as per the position of the Loudspeaker. The system should be independent of the Video Conferencing system and Hospital LAN/ IP. It should not use the CODEC of the video conferencing system.

The surgeon and his team should be able to do Bi-Directional Audio/Video communication from OT to Conference Room Class room, Lecture theatre, consultant room, outside hospital and outside country.

An HD 1080P (Mobile/stationery) Video Conferencing system along with wireless head wearing Microphone and speaker and amplifier system in OT should be offered for external communication from operating room in the Operation Room Complex. The system should be able to transfer high quality real time images and audio signals from multipoint at a minimum speed of 6-7 Mbps. The system should be compatible to both NTSC and PAL system with resolution up to XGA for transmission over the ISDN lines or IP Service. The conferencing system should be controlled via the touch screen of the integration system/ Remote Control of

the Video Conferencing system from the OT. Suitable Number / Sets of Transmitters, Receivers and Cables, connectors and accessories should be offered as per the requirement.

Full High definition (1080p) Video Conferencing system should be integrated with head wearing microphones of the surgeon along with amplifier - speaker of the OT for Audio from the far-site.

Dedicated one number of Full High Definition Video Conferencing system shall be deployed in the seminar hall by the contractor.

All the necessary Audio cable, speaker cable both within Operation Theatre & outside, which is necessary for Bi-directional Audio communication between OT & Seminar Hall and outside hospital and outside country shall be within the scope of the bidder

The touch panel of Integration system, Video Conferencing System is connected for surgeon to have bi-directional audio/video communication over IP.

For conference calling, VC shall be used. An In-ear system is equipped with the Surgeon Control panel (To be provided by the MOT contractor) of the MOT to allow the caller to make discrete telephone conversation. Wireless Head wearing microphone shall be used with Full High Definition Video Conferencing and speaker/amplifier shall be used for play back of any audio sources inside the OT

Two way communications of Audio & Video should be done from OT to OT. Two way Communication of Audio should be provided from Change room of Resident, Sisters' faculty and Sisters' in-charge room.

3 CENTRAL CONTROL SYSTEM

- 3.1 Medical grade touch screen or tablet (19"-22") for controlling the AV communication, documentation and review/preview of Live images and video sequences from the OT (eg. Images from C-arm, endoscope, OR light camera and Microscope).
- 3.2 Should have provision to record the images and video sequences from OT.
- 3.3 The Digital Dual Documentation System for parallel recording of videos/stills from two Video sources should be a high-end computer system based on Windows embedded platform (for security purposes) designed specifically for recording, managing, and archiving surgical images and video in native 4K, 3D and full HD resolution. The captured full high-definition images & videos can be accessed from the hard drive for printing or saving onto multiple forms of external media which includes USB Flash Drive & Hospital network It should be able to preview and simultaneously record views from two video sources parallel and archive as single patient file. Patient and image data should be able to call up and distributed to required monitors in the operating room.

3.4 The system should be capable to route any running high-definition surgical videos, which is being recorded in it, onto any display device in an operating room.

3.5 It should have at least 2 TB or more internal Hard Disk Drive (HDD) for in-system archiving. Also, it should have a feature of real time in-procedure DVD burning besides at-the-end procedure DVD burning. 500 GB internal storage and 2 TB external storage HDD for archiving. Compatibility to Network attached Storage (NAS) in the specs. for more storage of huge data. The recorder should have one output each for DVI, HD-SDI, Composite Video & S-video for routing the image if required. The recorder should have two inputs of DVI, HD-SDI, Composite video & S-video inputs for recording from various sources on 2 channels.

3.6 WHO surgical safety check list should be provided

4 HIGH DEFINITION MONITOR FOR IMAGE DATA MANAGEMENT SYSTEM

4.1 Should have individual high definition medical grade 42"-46" or more wall mounted HD LED monitor US FDA/European CE certified, wall mounted (**to display images from PACS**). The positioning of the monitor is flexible and shall be decided at the time of finalization of layout for construction of Modular OT.

4.2 Patient and image data should be able to call up and distributed to required monitors in the operating room

5 CAMERA (PTZ) INSIDE OT'S

5.1 The bidder should install the room camera inside OTs

5.2 It should have high speed 100 degree per sec for Pan angle, 90 deg per sec for tilt angle and 18X optical, 12X digital for zoom or more with power supply and reliable strong mounting assembly.

5.3 It should be integrated to the central control system. and it should be controlled via touch screen of integrated system

5.4 It should be high speed cameras, with pan tilt with power supply and reliable strong mounting assembly.

APPROVED MAKE- KARL STORZ/STRYKER/OLYMPUS/MACQUET/TRUMPH/BRAINLAB

- **Third party quality certification of the integration items from SGS/TUV(sud)/Lloyds/Bureau Veritas should be submitted by the contractor with contract No (Contract No. in the third party certificate should be mentioned).**

TECHNICAL SPECIFICATION OF ITEMS & EQUIPMENT OF KITCHEN

CENTRAL KITCHEN

1. Preparation Table with 1u/s

Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 2000x600x850

2. Wall shelf

Shelf constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet 2000 x 600

3. Single Burner Stock Pot

Top of 16 swg. S.S-304 Sheet on M.S Angle frame work duly rust proof painted on SS-304 Tubular/ Square legs with adjustable bullet feet for uneven floors. Fitted with United/Sarna make heavy duty burner with pilot lamps with individual control valves and heavy duty cast iron pan support. Size- 750x750x600

4. Side Table

Same as sl.ni.1. Size- 1500x600x600

5. Exhaust hood

Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease collection tray and hung/fixd with metal fasteners. Size- 4800x2000x600

6. Boiler (Tilting)

Double walled glass wool Insulated all S.S-304 Sheet body. The outer Most is of 18swg S.S-304 Sheet body. Fitted with heavy duty high pressure burner with pilot lamp & individual control valves. Fitted with water inlet & water outlet valve & strainer at the bottom level of the boiler also fitted with a Top opening lid with insulated handle. The entire boiler is mounted on heavy duty tubular legs. Also fitted with a heavy duty tilting gear to extract the boiled food. Size- 150 Ltrs.

7. Brazing Pan (Tilting)

Double walled mineral wool insulated all S.S-304sheet body on heavy duty tubular legs with adjustable bullet feet. Fitted with heavy duty burner with pilot lamp with individual control needle valve. Fitted with tilting gear to extract contents after cooking & water inlet valve. Also fitted with top opening lid with insulated handle. Size – 80 Ltrs.

8. Exhaust Hood

Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease

collection tray and hung/fixed with metal fasteners. Size- 5400x1200x600

9. Masala Trolley

The entire trolley is made on SS sheet body to keep inserts for preparation on tubular legs on 4 nos castor wheels-2 with breaks and 2 normal. Also fitted with a bottom shelf/cross brazings. Size-800 x 500 x 900

10. Chapatti Plate cum puffer

Structure made of mild steel angle frame duly rust proof painted . Top of 12 mm mild steel, front Panel and under shelf 18swg S.S-304sheet, vertical legs of S.S-304 round pipe of 16swg. 1.5” diameter with nylon adjustable feet. Complete with CI perforated grill for puffing of chapattis, heavy duty high pressure RV burner pilot, individual control valves Indian Oil corporation approved. Size- 1500x600x850

11. Chapatti Rolling Table (Manual)

Top made of 16swg S.S-304 sheet on MS Angle frame work with rust proof painted on S.S-304 square pipe 25x25mm/Tubular legs frame work and under shelf made of 18swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg. 1.5” dia with nylon adjustable feet. Size- 1200x600x850

12. Chapatti Making machine

L.P.G/PNG for heating. Fully automatic, compact, single unit machine to produce home-like chapattis in most hygienic way. The machine should produce balls from dough, rolls them into chapattis, cooks them by turning sides on Tawas and puffs them the way it is done at home. The machine produces soft & tasty chapattis without oil. Complete with accessories as per specification. Capacity-2000 Chapatti/hr. Make- KM Group/Chapatti Queen/Equivalent

13. Chapatti collection Trolley

Structure made of MS angle, duly rust proof painted Body completely constructed of S.S-304 sheet. Sunken top of 16 swg.S.S.-304 Sheet on S.S tubular legs on heavy duty wheels- 2 with breaks & 2 normal. Size- 750x600x850

14. Exhaust hood

Entire exhaust is made of 20 swg.S.S-304 Sheet with S.S-304 baffle filters. Fitted with grease collection tray and hung with metal fasteners. Size- 1800x1500x600

15. Work Table with sink

Top of 16 swg S.S-304 sheet on SS frame work on Structure made of S.S-304 square/Tubular pipe. Sink made of 14 swg S.S-304 on LHS/RHS and under shelf made of 18 swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg. 1.5” dia with nylon adjustable feet. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 1200x600x850+150

16. Side Table

Same as sl.ni.1. Size- 1200x600x850

17. Dough Kneader

Body completely constructed of heavy duty cast iron with gear box mounted on the top the mixing bowl of S.S-304 sheet 14 swg with S.S-304 arm to mix the dough and is operated electrically with heavy duty motor of 1 hp. Motor shall be S1 type of IS : 325 standard (Latest version) and of Kirloskar/NGEF/Siemens/ABB/GEC/ Crompton Greaves make. Capacity -25 Kg.

18. Garbage Cart

Moulded Plastic container -100 Ltrs capacity fitted with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

PREPARATION AREA

1. Preparation Table with 1u/s-

Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip.
Size- 1800x600x850+150

2. Wall shelf

Shelf constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet Size- 1800x300

3. SS stand for Chopping blocks with boards

All S.S-304 sheet body to hold poly carbonate chopping boards-4Nos. Size-600x600x850

4. Vegetable Cutter

Table top ,Professional 3.5 lts bowl capacity professional grade food processor, mixture, grinder complete with SS 304 grade cutter S type blade, transparent lid, with handle , water proof control panel with off & on simple touch button. Variable speed, 300 - 3000 rpm selection, 420 AISI SS blade, powerful induction motor on ball bearing. safety device to operate only when cover is closed. Operationable on 220 volts, 50 Hz single phase.etc as required. provided with standard set of attachments /discs/ tools blades for cutting/ slicing/ shredding etc. MAKE : DITTO ELECTROLUX/HOBART/ CAPLAIN. Capacity-200 Kg/hr.

5. Potato Peeler

The heavy duty peeling drum is made of 18 swg. SS sheet on three nos tiny legs with adjustable bullet feet and a rotating disc of SS sheet being connected with heavy duty motor of S1 type of IS:325 standard, single/three phase. Also pasted with emery granules inside the drum and on rotating disc to peel and fitted with water inlet valve and aluminum casting/SS sheet our pour to extract peeled potatoes. Make-Robotcoupe/Sirman/Haudie. Capacity-10 Kg

6. SS Double Bowl Sink unit R.H.S

Top of 16 sg. SS sheet on S.S. Angle frame work on S.S square legs with adjustable bullet feet for uneven floors. Also fitted with a large sink on RHS. Also fitted with a back splash and under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. The bowl size 500x500x250. Size-1500 x 650 x 850 + 150 spl.

7. Pulverizer

5.0 HP motor 2800 RPM three phase 440 volts, hopper size should be 15 ltrs, in stainless steel body free standing ,Grinding chamber size should be arr 150 mm x 150 mm.

8. Garbage Cart

Moulded Plastic container -100 Ltrs capacity with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

PANTRY/SPECIAL DIET

1. Work table with sink

Top of 16 swg S.S-304 sheet on SS frame work on Structure made of S.S-304 square/Tubular pipe. Sink made of 14 swg S.S-304 on LHS/RHS and under shelf made of 18 swg S.S-304 sheet. Vertical legs of S.S-304 round pipe of 16 swg, 1.5” dia with nylon adjustable feet. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 1500x600x850 +150.

2. Coffee/Tea Machine Dispenser

Double walled glass wool insulated all S.S-304 Sheet body. Fitted with 3.0 kw heating element with auto temp. controller & indicating lamp, water level indicator, Gun metal faucet one for water and another for milk. Capacity 250 cups/hr.

3. Preparation Table with 1u/s-

Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 2000x600x850

4. Micro oven

Convectional type, Capacity-30 Ltrs. Make-IFB/Equivalent.

5. Conveyor Toaster

Capacity 750 slices per hour. Power consumption should not be more then Arr 2.8 kwatt,220 volts, stainless steel table top model, should be based on belt speed inplace of heating temperature for toasting colour. stainless steel element. with variable speed. Should be able to work both sides either front or rear. stainless steel .supplied with all accessories & attachments. crumb tray /discharge tray should be provided. continous toasting with thermostatic setting.High

quality components & accurate timer control. Unit size should be approx. 455x355x415mm
Make ; LINCAT (CT -10) /HATCO (TQ-800)HPA/CROMO

6. Sandwich Griller

Self balancing top double plate. plate descent adjustable by means of brass brakes, thermostatic controls with 0 deg c to 300 deg c temperature range with warning lights(=live/yellow= plate temperature). spring with anti breaking system. complete body with fixed joints. supplied with steel cleaning brush. Double griller. Orion 2 (Italy) ARISTARCO/ PANINI/ SIRMAN

7. Egg boiler

Capacity-120 pcs. Electrically heated, Heat insulated Container should be of SS 304 material

8. Milk boiler

Triple walled mineral wool insulated all SS -304 sheet body on SS-304 legs with adjustable bullet feet. The outer most wall and the second wall is mineral wool insulated and the other wall water proof and fitted with water inlet, outlet, over flow valves and water level indicator. Also fitted with 3.0 kw immersion type heating element with auto temperature controller and indicating lamps and a heavy duty gun metal faucet. A top opening lid with insulated handle is fitted . Also fitted with two nos, insulated handles on either sides to carry. Capacity- 100 Ltrs.

9. Water Boiler.

Double walled mineral wool insulated all S Sheet body on SS legs with adjustable bullet feet. Fitted with 3.0 kw immersion type heating element with auto temperature controller and indicating lamps. Also fitted with a top opening lid with insulated handle and two insulated handles on either side to carry Capacity- 80 Ltrs.

10. 4 Burner Gas Range with Oven Below

Top of 16 swg. SS Sheet on M.S Angle frame work on SS Square legs with adjustable bullet feet for uneven floors. Fitted with United/Sarna make heavy duty burner with pilot lamps with individual control valves and heavy duty cast iron pan support. Also fitted with an electrically operated oven beneath. Size-950 x 950 x 850 + 150 Spl.

11. Exhaust hood

Complete frame work 20/22swg. Complete joints are air tight insulated weather proof mechanically painted on the Upper surface. S.S-304 filters-island type. Size- 5400x1200 x600

12. Idly Steamer

Doubled walled mineral wool insulated all SS sheet body on tiny tubular legs with adjustable bullet feet. Fitted with two nos immersion type heating element of 3.0 KW each with individual auto temperature controller and indicating lamps and SS hinges inside to keep detachable idly trays. Also fitted with water inlet, outlet valves and water level indicator. A front opening insulated door is fitted at the service side. 120 Idlys.

13. Juicer

Compact design- fits almost anywhere, under counters or worktables.

14. Hand wash Unit

Splash as per Layout (Rear & against side wall) Front & free side marine edge. 350mm dia.x200mm High Die Pressed Sink complete with 38mm dia. C.P. Drain Waste Out let. 16 gauge S.S-304 wall brackets. Secured to top with Acorn nuts & Bolts & Bracket secured to wall with anchor fasteners. Rear & Both sides 20 gauge S.S-304. One Deck mounted Jackson Swivel type water mixer water faucet. Unit mounted 865mm AFF Size- 600x600x450.

15. Garbage Cart

Moulded Plastic container -100 Ltrs capacity with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

POT WASH

1. Pot Rack-4-shelves

The heavy duty 4 tiers rack are made of S.S-304 square pipe (38mm & 25mm) and duly welded with 4 nos. uprights on nylon adjustable feet for uneven floor. Size- 1200X600X1650

2. Pot Rack

All the shelves are S.S-304 Square/Round pipes on 4Nos Square/Round legs with adjustable bullet feet. All the joints are firmly welded and nicely grinded, polished and puffed to a smoother finish. Size-1200x450x1650

3. Two Sink Pot wash

The structure made of SS: 304 square pipe 25 x 25 mm Angle frame work duly rust proof painted. Top & sink made of 14 swg and under shelf made of 18 swg SS: 304. Vertical legs of SS: 304 round pipe of 16 swg. 1.5inch dia. With nylon adjustable feet. Size- Sink Size- 600x600x450

4. Pot wash Sink

To be constructed with Brick and Cement (Masonry Work) and finished with tiles Size- 2000x1500x600

5. Hot water Geyser

Horizontal Capacity-100 Ltrs.

6. Garbage Cart

Moulded Plastic container -100 Ltrs capacity with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

DISH WASH

1. Dish Washer

Single Tank Rack conveyor type. 6 to 8 plates per rack, Cycle time 1.5 minutes. At least 155 Rack/hr. with **Drier**. The position of Dish Washer i.e RHS/LHS depends on loading and unloading table (As per layout drawing) Make-Winter Halter/ Electrlux/Hobart with Drier

2. Pre-rinse Jet spray

The spray unit to be fitted with hot & cold mixer. **Imported**

3. Soiled Dish Landing Table with glass Rack with Garbage chute

The marine edged top made of 16 swg SS: 304 sheet on MS Angle frame work, duly rust proof painted & stud welded for stronger grip and cross bracing of 18 swg SS: 304 sheet. Vertical legs with nylon adjustable feet. A Garbage chute is provided on LHS & a glass is fitted on the D.L.T. 1500X800X850 +60

4. Clean Dish Table

Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted & stud welded on SS. Tubular/square legs with adjustable bullet feet. Also fitted with SS slide out beneath to hold the plate/glass racks of 500 x 500 mm Size-900x800x850+150

5. Wiping Table

Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted & stud welded on SS. Tubular/square legs with adjustable bullet feet. Also fitted with an under shelf of 18 swg. S.S. Sheet of 18 swg. With adjustable bullet feet.

6. Hot water Geyser

Horizontal Capacity-60 Ltrs.

7. Bussing Trolley

The two tiers trolley is made of 18 swg. SS sheet on tubular/square legs on castor wheels with a push cart type handle. Fitted with cushion guard on all sides to prevent the damage during operation. Size-900x600x900

8. Dish Storage Rack

All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability. Size-900x450x1800

9. Wall Shelf

Shelf constructed of 18 swg S.S-304 sheet & supports constructed from the 16 swg sheet Size- 900 x 300

10. Clean Dish Rack

Entirely constructed of S.S-304 round pipe with verticals and slides of 1.5 inch and inside shelves S.S-304 sheet 18 swg. The rack with 5 tiers is mounted on four nylon adjustable feet. Size- 900x450x1800

11. Dish Wash Basket Trolley

Top 16 swg S.S-304 sheet on MS Angle frame work duly rust proof painted on tiny castor wheels. Fitted with a push cart type handle.

12. Garbage Cart

Moulded Plastic container -100 Ltrs capacity with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

SET-UP AREA

1. Plate Dispenser

Top of 16 sg. SS sheet on S.S. Angle frame work on S.S squarelegs with adjustable bullet feet for uneven floors.. Also fitted with a back splash and under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 800 x 400 x 850

2. SS Tray Cutlery Trolley

The entire is made of S.S. hinges on S.S. square uprights on castor wheels. Size- 375x500x850

3. Preparation Table with 1u/s

Top of 16 swg S.S-304 sheet on M.S Angle frame work duly rust proof painted on structure made on SS square/tubular legs with adjustable bullet feet for uneven floors. Also fitted with a under shelf. The top is fitted with stud welded bolts with the frame for sturdy and stronger grip. Size- 1500 x 650 x 850 + 150 spl.

4. SS Rack on Castors

All five shelves are made of 18 swg. SS sheet on 4 nos round / square legs with adjustable bullet feet. All the shelves are having "C" channel through to accommodate maximum load bearing ability. Size- 1300 x 450 x 1800

5. Hot Bain Marie on Castors.

Integral with top & suitable to accommodate Six (6) Nos 300mm high GN 1/1 PANS with lid to be supplied #16 SWG S/S sheet tank integral with work top of water counter Fully coved corner insulated with 50 mm thick tightly packed glass wool on the exterior and base of internal tank & sheathed with 20 SWG s/s sheet on exterior Bottom of tank sloped to left side with 40mm dia brass waste w/angle valve # 18 SWG s/s perforated false bottom with all sides turned down 40mm in 12 mm two (2) nos 3.0 KW electric heating elements clamped 25mm off the bottom

complete with thermostat, on 0 off switch, red light and controls. Size- 2250x675x850

6. Hot Food Service Trolley

Double walled insulated with glass wool. Inner side made of 18swg & outer side made of 20 swg as Stainless steel 304 sheet with 4 no heavy duty Castor wheels (4"/6" dia) with 2 wheels locking arrangement and push cart type handle constructed from ss pipe. Trolley has Immersion type 3Kw heating elements with auto temp. controller & indicating lamp with temp. Indicator to keep 5 Nos big round containers of 10 ltrs. capacity each and 2 more small containers all with lids to keep food hot vegetable/soup/card etc. and one rectangular for container for to keep chapattis. Also fitted with one middle and bottom shelves with lockable door. Rubber cushion to be fitted at the corners to prevent damage during transportation. Size- 1200x600x900

7. Platform Trolley

The entire trolley is made of 16 swg. S.S. Sheet on M.S. Angle frame work, duly Rust proof painted on heavy duty castor wheels. The top to be stud welded with the frame for stronger grip. Also fitted with a push cart type handle & rubber cushion in front to avoid the damage during movement.

8. Garbage Cart

Moulded Plastic container -100 Ltrs capacity with 2 Nos-Big castor wheel. Garbage cart should be set to keep vertically upright on its base. Make-Cambro/Nilkmal/Sintex/Supreme

STORE

1. Dunnage Rack

Make Sintex/ Nilkamal/Supreme. Moulded typed Size- 900x600x250

2. Weighing Scale Electronic

Electronic weighing scales of standard make to weigh upto 300 kg. The certificate from Weights & Measures Dept. is to be attached with the machine, duly certifying the serial no. Capacity-300 Kg. Make- Atco/Sanchit

3. Storage Rack with 5 tiers for Vegetable store

All shelves are made of 18swg S.S-304 sheet on 4 nos round/square legs with adjustable bullet feet. All the shelves are having "C" channel through to accommodate maximum load bearing ability Size- 900 x 450 x1800

4. Two door Refrigerator

Two/ single door unit, 650 Lts capacity, temperature range -2 deg C to +10°C. External and internal in AISI 304 stainless steel. High-density, expanded polyurethane insulating foam, 70 mm in thickness. Full door with lock and micro-switch to switch off the fan when the door is opened. Built-in Danfoss make refrigeration unit; Cooling capacity 1300 (watt).ventilated operating mode; digital control; automatic or manual defrost with automatic evaporation of defrost water; external digital temperature display; electronic thermostat. Humidity level adjustment. Internal lighting. Cavity drain. For ambient temperatures up to 43 °C. CFC and

HCFC free. R134a gas in refrigeration circuit. Gas in foam: Cyclopentane. Supplied with n. 4x2/1GN Rilsan coated grids and n. 4 sets of 2 stainless steel grid runners. Dimensions (WxDxH mm): 725 x 825 x 1975, Power (kW): 0.52, Power supply: 230 V-1N -50. Fitted with Dixcell controller & EBM fan motor. The sheet thickness in the top & body should be 1.00 MM & 0.8MM. Mounted on adjustable feet. Confirming to HACCP Control. External locking arrangement should be provided, should have provision for USB compatibility, RS485 interface & integrated data logger, prepared for GSM alarm, & contact for remote control, door opening alarm, adjustable high/ low temperature & visual & acoustic alarm.

5. Four Door Refrigerator

1410 lts, -2 deg C to +10 deg C, External and internal door and side panels in 304 AISI stainless steel. External back and top panel in galvanized steel. High-density expanded polyurethane insulating foam, 70mm in thickness 4 half doors with lock and microswitch to switch off the fan when the door is opened. Built-in refrigeration unit; Cooling capacity 1800 (watt) ventilated operating mode; digital control; automatic defrost and evaporation of defrost water; external digital temperature display. For ambient temperatures up to 43 °C. CFC and HCFC free. R134a gas in refrigeration circuit. fitted with Danfoss make compressor, Gas in foam: Cyclopentane. Supplied with n. 8x2/1GN nylon coated grids and n. 8 sets of 2 stainless steel grid runners. Overall Dimensions (WxDxH mm): 1450 x 825 x 1975, El. Power (kW): 720. Fitted with Dixcell controller & EBM fan motor. The sheet thickness in the top & body should be 1.00 MM & 0.8MM. Mounted on adjustable feet. Confirming to HACCP Control. should have provision for USB compatibility, RS485 interface, & integrated data logger, prepared for GSM alarm, & contact for remote control, door opening alarm, adjustable high/ low temperature & visual & acoustic alarm.

6. Four Door Freezer

1410 lts, 18 deg C to -22 deg C, External and internal door and side panels in 304 AISI stainless steel. External back and top panel in galvanized steel. High-density expanded polyurethane insulating foam, 70mm in thickness 4 half doors with lock and microswitch to switch off the fan when the door is opened. Built-in refrigeration unit; Cooling capacity 1800 (watt) ventilated operating mode; digital control; automatic defrost and evaporation of defrost water; external digital temperature display. For ambient temperatures up to 43 °C. CFC and HCFC free. R134a gas in refrigeration circuit fitted with Danfoss make compressor, Gas in foam: Cyclopentane. Supplied with n. 8x2/1GN nylon coated grids and n. 8 sets of 2 stainless steel grid runners. Overall Dimensions (WxDxH mm): 1450 x 825 x 1975, El. Power (kW): 720. Fitted with Dixcell controller & EBM fan motor. The sheet thickness in the top & body should be 1.00 MM & 0.8MM. Mounted on adjustable feet. Confirming to HACCP Control. should have provision for USB compatibility, RS485 interface, & integrated data logger, prepared for GSM alarm, & contact for remote control, door opening alarm, adjustable high/ low temperature & visual & acoustic alarm.

7. Water Cooler with RO system

Structure made of mild steel angle frame duly rust proof painted. Body completely constructed of S.S-304 sheet double walled insulated with puf, Inner tank of 22 swg and outer of 20 swg S.S-304 sheet food grade. The water cooler is mounted on four S.S-304 tubular legs with S.S-304 bullet adjustable feet. Complete with compressor and condenser unit with automatic temperature controller and temp. Indicator. Capacity-250 Ltrs. Make-Bluestar/Celfrost/Cibwal

8. Onion/ Potato Bin

The entire bin is made of S.S. wire meshed body on heavy duty castor wheels. Fitted with top

opening lid and the inclined bottom to have a lockable door to extract. Size- 900x600x750

9. Cereal/Atta/Maida Bin

The entire bin made of 18 swg S.S-304 sheet on tiny caster wheels & with top opening lid. Size- 600x600x750

10. Cold Room

RoomSize-4500X3000X2100 Temperature -0 to 4 degree centigrade Insulation:- Panels 60mm thick PU at 40-42kg density,PCGI exposed exterior 0.5mm thick sheet,PCGI exposed exterior 0.5mm thick sheet, PCGI interior 0.5mm thick sheet, floor interior and exterior of 0.5mm thick PCGI exposed sheet, Ceiling exterior PCGI, interior PCGI Sheet 0.5mm. Vertical, Panels Joint with Cam lock coupling in Tongue & Groove arrangement. Thickness of PUF Panels (for Wall, Ceiling & Floor)- 60mm. Wall & Ceiling panels Finish- Internal: SS 304 External: PCGI Galvanized Iron Sheet. Flooring- Kota stone by client. Density of Panels-40kg/cub.m No. of Doors- One for Main Room Type. of Doors- Over Lapped or Flash Type Door Size-900mm x 1950mm. Accessories Included in the scope of Supply-1. Door Alarm 2. Lock Defeat mechanism 3. Light Inside the cold room. 4. Handle, Hinges & Locks. 5. Microprocessor based digital control. Panels. 6. Panel Accessories & necessary Hardware. Technical Feature of PUF Panels, Doors, & Accessories: Individual Panel is manufactured with closed cell Rigid Polyurethane foam, injected at high pressure, which secures the bond with facing material to form a single piece construction. RPUF insulation is CFC free and has Zero ODP- Ozone Depleting potential. Core density of 40kg / Cu.M Panel finish is designed to resist many chemicals including most common cleaning agents. The panels have fire rating to BS.467 part 7, clause 1. Wall, floor & ceiling panels joined with Tongue and groove mechanism with cam lock system. The compressor and condenser unit of Emerson/ Techumshah/Kirloskar make with Automatic temperature controller and temp. Indicator. Room for Compressor, Condensor and control at the back of the Cold Room. Make- Bluestar/Celfrost/Mothersonzonetti/Carrier/Voltas/Phoenix Refrigeration

11. Storage Rack 5 tiers

All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability. Size- 900x450x1800

12. Storage Rack 4 tiers

All shelves are made of 18 swg SS: 304 on 4 nos round/square legs with adjustable bullet feet. All the shelves are having 'C' Channel through to accommodate maximum load bearing ability. Size- 800x450x1200.

13. Insect killer Twin tube. Branded.

14. Air curtain At entry points. Make- Mitwaz/Sanchit/Abros

LPG Bank

1. 20 + 20 (One set working another set standby) LPG Cylinder Bank of 14.2 Kg each LPG cylinder with :

- Class 'C' seamless steel pipe conforming to IS:1239 (Latest version) with Pressure Gauges (0-15 PSIG & 0-5PSIG, dial type),

- Pressure reducing stations complete with Flanges & accessories and Isolation valves having ball valves of approved makes with LPG installation certificate having carbon steel body, SS ball and PTFE seat, Laboratory tap and all other fittings such as tees, reducers, unions, elbows.
- Steel Grilled cage of area 32 ft x 4ft.with lockable door for keeping 20 + 20 Cylinder Bank.
- The piping shall be joined through welding by using welding electrodes of ISI marked only.
- The LPG piping works shall be duly supported with ceiling, on walls etc. by providing adequate supports. In no case the spacing between two supports shall exceed 1.5 meter. Adequate measures shall be taken to prevent pipe from undue stresses, sagging etc.
- The piping shall be free internally and externally of cutting burrs, loose scales, dirt, dust and other foreign matters before installation is completed.
- All care shall be taken to prevent rusting of piping during installation by providing red oxide primer coating.
- Suitable sleeve of GI/wood shall be provided wherever the pipes are crossing through the walls/slabs etc.
- The LPG shall be providing keeping a minimum distance of 100 mm from the electrical wiring system.
- On completion of installation, the LPG manifold shall be complete with all accessories and individual components/parts which are subjected to cylinder pressure shall be capable of withstanding a test pressure twice the working pressure or 26 Kg/sq.cm whichever is higher. Pressure testing of complete LPG system and obtain the pressure test certificate from appropriate regulatory authority.
- All the fittings used for installation of LPG line system shall conform to relevant BIS codes.
- The complete LPG pipeline system shall be installed in accordance with IS:6044 (Latest version), Gas cylinder rules 1981 with latest amendments, OISD July 1995 (latest amendments).
- All the accessories, components used for installation of LPG pipeline system shall have the approval from Oil Company.
- Isolation/shut off valves shall be ball valves with installation certificate for use in LPG pipelines and shall have carbon steel body, Stainless steel ball and PTFE seat.
- After completion of installation, the entire pipeline system shall be given at least two coats paint as per LPG colour norms.
- The work of supply, installation, testing and commissioning of LPG manifold and supply system shall be carried out only by specialized agency shall have certification for carrying out similar jobs from Oil Companies like IOCL/BP/HP.
- The entire work of supply, installation, testing and commissioning of LPG manifold and supply system shall be carried out in accordance with directives of Oil Industry safety directorate and of Bureau of Indian Standards and using materials having necessary approvals for use in LPG installations.
- The contractor shall submit detailed shop drawings of LPG manifold, piping layout and piping installation details for approval. The items covered under the scope of works shall include all those ancillary items which may be required to complete the work in all respect whether specifically mentioned or not.

- Fire fighting arrangements for LPG Bank should be as per the guidelines of statutory body/local authority/State Government/Central Government.

Name of Manufacturers **Kumar Equipment Delhi/Dolche India Delhi/Klas Products
Delhi/Bharti Refrigeration**

TECHNICAL SPECIFICATION OF ITEMS & EQUIPMENT OF MECHANISED LAUNDRY

1. SLUICING CUM WASHER EXTRACTOR

For removal of blood stains, faecal matter, vomit and other residue

For washing cleaning and extraction

Capacity -60 kg , Steam/Electrically Heated,

Front loading, Heavy duty, High Spin, Soft Mount, Suspended, Variable frequency drive & Auto reverse & forward, Open pocket & Front display.

- a) Control - Fully programmable Microprocessor/Computer controlled
- b) Dispenser - 5 compartment detergent dispensers
- c) Outer Drum - Made of Stainless steel AISI-304 with 2mm thickness
- d) Inner Drum - Made of Stainless steel AISI-304 with 2 mm thickness of basket, CNC Perforated
- e) Outer Cabinet - Made of Stainless Steel sheet AISI-304 and channels, Welded structure, Finished with polishing
- f) Door - Made of die pressed Stainless steel AISI 304 quality, 2 mm thickness, Toughened glass window , SS door latch/handle and interlock for safety
- g) Door Opening - 500 mm Ø (Minimum)
- h) Level Sensor - Highly sensitive auto water level sensor with PLC
- i) Seal - High quality seal to be used to prevent contact of water with the Bearings
- j) Bearing Housing- Roller bearings of reputed brand duly packed with grease & Lubricants
- k) Wash RPM - 35 (Minimum)
- l) Final Extract - More than 700 RPM
- m) G-Force - 320 G or more
- n) Motor - Large capacity motor with variable frequency drive for wash,
 - a. distribution, low, normal and high spin.
- o) All wet materials and components must be of AISI-304 Stainless steel
- p) All Stainless steel components should be TIG welded and highly polished.
- q) In-built Control Panel and Motor

2. WASHER EXTRACTOR

For washing cleaning and extraction

Capacity -60 kg , Steam/Electrically Heated,

Front loading, Heavy duty, High Spin, Soft Mount, Suspended, Variable frequency drive & Auto reverse & forward, Open pocket & Front display.

- r) Control - Fully programmable Microprocessor/Computer controlled
- s) Dispenser - 5 compartment detergent dispensers
- t) Outer Drum - Made of Stainless steel AISI-304 with 2mm thickness

- g. Door Opening - and interlock for safety
500 mm Ø (Minimum)
- h. Basket Volume- 295 Ltrs.(Minimum)
- i. Suction Blower- Heavy duty Centrifugal Suction Blower and dynamically balanced
- j. Insulation - Glass wool duly packed on all sides & front of the drier to minimize the heat loss & saves energy
- k. Lint Screen - Self cleaning lint screen of Stainless Steel AISI-304. Facility of cleaning should be through front door
- l. All wet materials and components must be of AISI-304 Stainless steel
- m. All Stainless steel components should be TIG welded and highly polished.
- n. In-built Control Panel and Motor

4. FLATWORK IRONER CHEST HEATED/ROLLER HEATED (Calendaring m/c)

Suitable for rapid ironing of linen like Bed sheets, Pillow cover or flat sheet etc

Roller Size- 500 Ø mm x 3000 mm length,

Front feed and Rear Return Type, Variable Speed Control, Powder coated outer body

Auto timed and Auto temperature control

- a. Roller - Machined with perforations through out the length and periphery for moisture suction. Roller should run on self aligning ball bearings.
- b. No. of Rollers- 1 (One). padded with heavy duty heat resistant Numex/Polyester
- c. Ironing Chest- Sliding type. Grinded smoothly Polished Chest should move back and forth through pneumatic cylinders at both sides. Adjustable and uniform ironing pressure should be across the entire roll.
- d. Drive - Heavy duty chain drive with spring loaded adjustable sprockets and equipped with Geared Box Motor
- e. Drive Motor- 1.5 Kw (Approx.)
- f. Suction Motor- 0.37 Kw (Approx.)
- g. Control - Digital control with variable speed of Roller through VFD
- h. Roller Speed - 2-6 m/min
- i. Main body - Made of steel sheet of 1.5 mm thickness with powder coating
- j. Safety - Start and stop of the machine with emergency switch. Automatic stopping of the machine for Finger guard
- k. Padding- Galvanized coil type/leaf type springs should be covered with heat resistant double layer Polyester Padding of minimum 900 GSM
- l. All wet materials and components must be of AISI-304 Stainless steel
- m. All Stainless steel components should be TIG welded and highly polished.
- n. In-built Control Panel and Motor

5. FLAT BED PRESS

Suitable for linen like uniform, room furnishing, personal garments, Bed sheets & Pillow Covers

Head & Bed Size- 1500X750mm Electrically/Steam heated, Auto-timed, Auto-temperature controlled, Double Switch operation, Built-in Suction Blower, Pneumatically controlled,

- a) Head - Polished Stainless steel/High quality steel with Teflon coated/Nickel plated
- b) Main Body- Made of Mild Steel sheets of 1.5 mm thickness, Welded structure and finished with powder coating
- c) Rocker Arms- Should move on ball bearings. Front head weight should be counter balanced by Springs. A pneumatic cylinder should be attached to rocker arms for raising and lowering of the head.
- d) Bed- Large perforated bed with heat resistant Silicon/Molleton padding
- e) Blower- 0.75Kw Heavy duty Suction Blower with powerful suction
- f) Safety - Emergency Stop of the machine with emergency switch. Automatic stopping of the machine for Finger guard for operator safety
- g) Control - Frontally placed. Automatic digital timed release of the head at preset time. Push Button for raising and lowering of the head pneumatically
- h) Temperature- Digital temperature controller

6. BOILER

BOILER

Supply, installation, testing, commissioning of Boiler unit including steam piping upto Pure Steam Generator in the Laboratory on turnkey basis.

(NON - IBR) - BOILER		
3 pass high Efficiency boiler with a DOUBLE jacket design & a DUALBLOCK Burner		
Parameters	UNIT	
Capacity [F&A 100 °C]	kg/hr	850
Steam Dryness (At Boiler Outlet)	%	80
Steam Dryness After Steam Seperator	%	92
Steam Temperature / Pressure	°C / kg/cm ² g	185 / 10.54
Feed Water Temp. Inlet To Boiler		30 °C (AMBIENT)
Efficiency	As per BS 845- Part I, (On NCV Basis)	
Oil (+-2%)	%	88 and above

Boiler Construction - Material Of Construction		
Design Code For Material Thickness Calculation (Pressure Part)	IBR 1950	
Tube Material Of Coil	BS 3059, PART I, ST 320 (ERW)	
Material Of Jacket	IS 1079 / IS - 513 Gr.D - CRCA	
Burner Type	PRESSURE JET - REVERSE FLUE	
Burner Control	ON-OFF	
FUEL CONSUMPTION should be minimum		
HSD (NCV = 10500 Kcal/Kg)	kg/hr	Not more than 49.68
LDO (NCV = 10200Kcal/Kg)	Kg/hr	Not more than 51.14
Connected Load		
Electrical Load	415 Volt AC +/- 6%, 50 Hz +/- 3%, 3 Phase, 4 Wire.	
		(KW's are approximate)
Blower	kW	1.5
Fuel Pump	kW	0.37
Feed Water Pump	kW	1.5
Oil Pre Heater	kW	NA
Total Electrical Load (Light Oil)	kW	3.87
Dimensions		
Dimension (w/o Separator)		(Dimensions are approximate)
Height	m	2.89
Length	m	1.77
Width	m	1.42
Dimension (Separator)		(Dimensions are approximate)
Height	m	1.38
Width (Max Dimension)	m	0.60
Boiler Weight -Dry (W/O Separator)	kg	1100
Boiler Weight -Dry (With Separator)	kg	1246
Boiler Orientation/Installation	ONLY VERTICAL	
Connections		
Terminal Points Inlet/Outlet Sizes		(Dimensions are approximate)
Main Steam Outlet	NB	25
Auxiliary Outlet	NB	20
Safety Valve Outlet	NB	25
Blowdown Outlet	NB	20
Steam Sep. Inlet/Outlet	NB	65/65

Steam Sep. Blowdown / Drain	NB	20
Steam Sep. Condensate Discharge	NB	25
Fuel Oil Inlet	NB	1/2" BSP
Flue Gas Outlet Dia - ID	mm	250

SCOPE OF SUPPLY

One Pressure part assembly consisting of closely wound helical vertical membrane coil fabricated out of high temperature resistant ERW tubes and flats.

One Double jacketed air casing with an aluminum radiator to enclose the pressure parts and serve as an integral combustion air Preheater

AUXILIARIES

One each of the following:

Pressure atomized, Forced draft, Down firing burner assembly suitable for LDO-HSD firing.

Blower coupled with motor, mounted on bottom chassis, duly connected to the jacket. Fuel pump coupled with motor, mounted on pumping module. Water pump, with surge suppressor and relief valve, mounted on pumping module. Atmospheric economizer and heat optimizer to pre-heat feed water. Dust protected pre-wired control panel with necessary switch gear, power and control circuitry. Set of tool kit. Steam separator assembly

PIPING

Feed water line between optimizer, economizer, feed pump and boiler.

Fuel oil line between Fuel pump, Y-strainer, burner.

MOUNTINGS AND FITTINGS

Isolating needle valves for indicating instruments.

STEAM

Main steam stop valve

Auxiliary steam stop valve

Single port spring loaded safety valve

WATER

Transparent water filter

Drain valve for economizer

Relief valve on feed water pump

Non-return valve on feed water line

Ball valve for coil blows down.

FUEL

Strainer, "Y" type on fuel oil line.

Main Fuel filter (loose supply)

INSTRUMENTS, CONTROLS AND SAFETIES

Burner programmer with matching flame detector

Audiovisual alarms for abnormal conditions

STEAM

Steam pressure switch for burner ON-OFF control

Steam pressure gauge

Steam temperature indicator-cum-switch for high alarm

WATER

Low water level alarm switch on economizer
Blow down valve limit switch

FUEL

Fuel Pressure indicator.

FOLLOWING ACCESSORIES SHALL BE PROVIDED WITH THE BOILER:

FUEL OIL SYSTEM

FUEL OIL TANK

Capacity	-	400 ltrs
Length	-	750 mm
Breadth	-	750 mm
Height	-	750 mm
Thickness	-	05 mm
MOC	-	MS
Qty	-	1 No

The tank will be provided with the following nozzles:

Inlet nozzle	-	1 no
Outlet nozzle	-	1 no
Drain nozzle	-	1 no
Overflow nozzle	-	1 no
Gauge glass nozzle	-	2 nos
Vent nozzle	-	1 no
Manhole nozzle	-	1 no

The tank will be provided with tubular Level Gauge.

The HSD tank will be supported at an elevation of 3500 mm from floor level

FUEL OIL PIPING

- Fuel oil piping from outlet of service tank to the boiler.
- Oil bypass piping from burner to service tank.

LIST OF VALVES SHALL BE INCLUDED.

Outlet valve on fuel oil service tank	-	Ball	-	1 No
Strainer at inlet of boiler fuel oil pump	-	Y type	-	1 No
NRV at pump outlet on unit	-	Piston	-	1 No
Drain valve on service tank	-	Ball	-	1 No

1) WATER SYSTEM CONSISTING OF MULTIPOINT WATER SOFTENER

Maximum flow rate	m3 / hr	1.2
Minimum flow rate	m3 / hr	0.3
Output between Regeneration at 100 ppm hardness	m3	20
Resin Quantity	Ltrs	30
Operating pressure	kg / cm2	3.5
Qty	No	1

SCOPE OF SUPPLY FOR SOFTENER

FRP pressure vessel	One
Internal distribution arrangement comprising of top and bottom strainers with riser tube.	One set
Manual multiport valve with adaptors and built in ejector	One
HDPE brine tank	One
Brine suction tube with NRV and suction filter at bottom	One
Unit isolation valve with associated inlet / outlet flexible	One set Piping

CHEMICAL DOSER

TECHNICAL SPECIFICATIONS FOR DOSER (Values are approximate)

<i>Flow range</i>	<i>Lph (min./max)</i>	<i>0.04 / 4.0</i>
Max. Injection Pressure	kg/cm2	5.5
Supply Voltage		230VAC, 50Hz, 1 phase
<i>Quantity</i>	<i>No</i>	<i>1</i>

WATER SERVICE TANK

Capacity	-	1500 ltr
MOC	-	HDPE
Qty	-	1 No
The tank will be provided with the following nozzles:		
Inlet nozzle	-	1 no
Outlet nozzle	-	1 no
Drain nozzle	-	1 no
Overflow nozzle	-	1 no
Gauge glass nozzle	-	2 nos
Manhole nozzle	-	1 no

Tank elevation considered at 3500 mm from floor level.

WATER PIPING

From outlet of softner to inlet of doser

From outlet of doser to inlet soft water tank

From soft water tank outlet to inlet of feed water pump on boiler

Drain Piping from soft water service tank to ground level

LIST OF VALVES SHALL BE INCLUDED

Isolation valve at inlet of softner	Globe	-	1 No
NRV at outlet of doser	Swing	-	1 No
Isolation valve at inlet of soft water tank	Ball	-	1 No
Float valve inlet soft water tank	Ball	-	1 No
Isolation valve at outlet of water tank	Ball	-	1 No
Isolation valve at inlet of water pump on boiler	Ball	-	1 No
Strainer at inlet of pump on boiler	Y type	-	1 No
Isolation Valve on water line for water sampling	Needle	-	1 No.

3) NON IBR DRAIN & SAFETY VALVE EXHAUST LINES

- From air vent valve to atmosphere outside boiler house
- From Safety valve exhaust to atmosphere outside boiler house
- Economizer drain line to drain pit
- Common drain for level gauges and level switch upto drain pit

4) STEAM SYSTEM CONSISTING OF STEAM PIPING (NIBR)

- From steam stop valve on Boiler to inlet of PRS
- From outlet of PRS to inlet of process with SS 304
- Blow down line from outlet of blow down valve to blow down pit.

LIST OF VALVES INCLUDED

Isolation valve at outlet of boiler	Gate	-	1 No
Isolation valve at inlet of PRS	Gate	-	1 No
Isolation valve at inlet of utility/ process	Gate	-	1 No
Steam trap for process piping	TD	-	4 Nos
Valve on steam separator drain	Gate	-	1 No

5) PRESSURE REDUCING STATION

S.No	Description	Unit	Value
1	Flow	Kg/hr	850
2	Inlet Pressure	Kg/cm2g	10.50
3	Outlet Pressure	Kg/cm2g	7.50

Scope Of Supply For PRS:

S.No	Item Description	Make	Qty
1	Isolation Gate/Bellow seal Valves	Expert/ Thermax	2
2	Bypass Globe/ Bellow seal Valves	Expert / Thermax	1
3	Strainer	Darling	1

		Muesco	
4	Moisture Separator with Drain Trap Assembly	Fabricated	1 Set
5	Pressure Reducing Valve	Samson	1
6	Safety Valve	Darling Muesco	1
7	Pressure Gauges	Gluck	2
8	Condensate Pot and Impulse Tubing	Fabricated	1 Set

6) FLUE GAS SYSTEM

DUCTING.

Flue gas ducting should be of size 250 mm dia fabricated from MS plate 5 mm thick from the boiler to the chimney (max 6 mtrs considered). The ducting inside the boiler house shall be insulated with 50 mm thick light resin bonded mineral wool mattress of 100 mm density. The mineral wool shall be protected with aluminum cladding of 24 SWG from outside.

CHIMNEY (Self supported 300 mm DIA X 30 Mtr. Height)

CS self supported Chimney shall be having top diameter of 300 mm and height of 30 mtrs. The Chimney shall be provided with cage ladder upto platform at 12 Mtrs and stepladder to the top. Sampling port shall be provided at the landing. The scope of supply should include template, lightning arrestor, earthing strip upto ground level and foundation bolts. The chimney shall be coated with heat resistant Aluminium paint from outside.

7) INSULATION FOR STEAM LINES AND DUCTING

Resin bonded Rock wool shall be having density of 100 Kg / m³ and a thickness of 50 mm with wire netting on one side, stitched with the 20 SWG - GI binding wire wherever necessary. 24 SWG aluminium sheet with self-tapping screws shall be used for protecting mineral wool mattress.

8) STRUCTURE

Supporting structure shall be fabricated using MS angle, channels and beams for supporting soft water service tank and fuel oil service tank at an elevation of 3500 mm. The structure shall be having 600 mm working platform at the top and cage ladder for access of the platform.

SCOPE OF ERECTION IN TURNKEY WORKFOR BOILER:

- Steam leading of Boiler and its auxiliaries up to the Pure Steam Generators 350 Kg/sq.cm -2 Nos from the boiler house.
- **SS-304 Piping(2"/1½" dia) for supply of steam at 6 kgf/sq.cm at PSGs along with insulation and Aluminium sleeving and the required Valves, Pressure, Temperature Gauges, Joints(Tee, Elbow, Flanges) Gaskets for supply of steam to PSG-2 Nos in two labs.**

- Placement and alignment of boiler
- Erection of softener
- Erection of doser
- Erection of Pressure reducing station
- Fabrication and erection of structure for tanks
- Erection of fuel oil and water service tanks
- Fabrication of water piping, fuel oil-piping, steam piping.
- Hydraulic test of pipelines.
- Erection of self supported chimney
- Fabrication & erection of flue gas ductings
- Insulation of flue gas ducting and steam piping
- Providing of documents to IBR office
- Completion of process for volumetric test and NIBR documentation
- Preparation of civil foundation for steam boiler & painting.
- Installation of PRS
- Insulation and aluminum cladding
- Erection of steel structure for coil removal
- Erection Electric Control Panel with internal electrical connection.
- Commissioning of the system.
- All civil work including grouting of foundation bolts and boiler house erection.

In addition to the above any other works necessary for completing installation and commissioning of Boiler System along with insulated steam piping including requisite spares upto the Laundry equipment installed at the Service floor in two adjacent labs shall be done in turnkey works.

Thermax/Elite/Equivalent

7. VACUUM FINISHING TABLE WITH IRON

Adjustable height.

Table Top Size -1200mm X 750mm

- a. Table top - Mild Steel sheet of 2.5 thickness padding with heat resistant material like Silicon etc. Perforated flat top padded with high porosity
- b. Main Body - Made of Mild steel sheets/plates and finished with powder coating
- c. Blower - Heavy duty Powerful suction through Centrifugal blower of 0.5hp Motor activated by spring loaded full length foot pedal working in combination with heavy duty micro switch
- d. Heater - 1 Kw In-built Thermostatically controlled stainless steel heater
- e. Electric Steam - Die cast sole plate, Teflon shoe and thermostatically controlled Heating element with moisture trap, Rubberized handle

8. AIR COMPRESSOR

- a. The air compressor of Ingersolrand/ Elgi/Kirloskar make shall be multistage stage, fully automatic suitable for delivering dry compressed air at pressure compatible to Ironer.
- b. Drive - Belt driven with pulleys, belts and belt guard.
- c. Motor - 7.5 hp.

9. MENDING MACHINE

Automatic motorized Mending machine or motorized sewing machine shall be heavy duty type with all metallic shuttle, and moving parts. The machine shall be complete with mounting table with adequate space for placement and movement of garments to be stitched/mended. The machine shall have a table mounted drive motor foot pedal operated for convenience of operation with both hands free.

10. WASH ROOM TROLLEY

Capacity -50Kg

The wash room trolley shall be fabricated out of Stainless Steel AISI-304 tubes and flats in all welded construction ground smooth & finished, supported on swiveling wheels.

11. DRY LINEN TROLLEY Capacity-50 Kg

The dry linen trolley shall be designed in Stainless Steel construction with all welded joints ground & smooth finished out of Stainless Steel tubes and bars and foldable front. The base frame shall be supported on 4 Nos. castor wheels min. 75 mm size of swiveling type.

12. MOBILE TABLE

Table top size-1200mm x 750mm x 800mm -2 Nos & 1800mm x 900 mm x 800mm-2 Nos

The folding table shall be specially designed for carrying rolling and folding of linen in the laundry. The frame of the table shall be fabricated out of MS welded construction with one bottom shelf for storage. Complete with heavy duty ball bearing for swiveling wheels. The table top shall be of polished Stainless steel.

13. SHELF TROLLEY (Finished linen) Capacity -100Kg

The linen trolley shall be designed in Stainless Steel AISI-304 construction with all welded joints ground & smooth finished out of Stainless Steel tubes and bars and foldable front. The trolley shall be fitted with at least 4 Nos. AISI-304 Stainless Steel shelves(2-shelves removable). The base frame shall be supported on swiveling wheels.

14. LAUNDRY SCRUB STATION WITH 2 SINKS.

Stainless Steel Construction. S.S Sinks with taps for wash and rinse using hot and cold water. SS Scrubbing Board in between Sinks. Underneath Shelf. Size-1600x500x900 ht. Details of technical data are as per technical specification. Size of sink- 500x500x 450 mm

15. STORAGE RACK

Size - 1200mmx460mmx1800mm shelves; Made of Stainless Steel-AISI-304, Finished with Polishing

16. INDUSTRIAL WEIGHING MACHINE Capacity -300 Kg.

Electronic weighing machine with digital display. Electronic weighing scales of standard make to weigh upto 300 kg. The certificate from Weights & Measures Dept. is to be attached with the machine, duly certifying the serial no. complete with accessories as per specification.
Make- Atco/Sanchit/Equivalent

**Approved Manufacturer of
Major Laundry Equipment - ELECTROLUX/GIRBAU/MILLNOR/BOSCH**

- **Third party quality certification of the laundry equipment from SGS/TUV/Lloyds should be submitted as “ Certifies that the laundry equipment meets the technical specification and BOQ of the tender document”.**

TECHNICAL SPECIFICATIONS FOR ITEMS & EQUIPMENT OF MGPS

Standards/Guideline

The design & selection of all imported items should be of international standard like NFPA 99(latest version) standard and UL listed or ISO-7396-1/DIN/ EN (latest version) and UL listed/European CE or HTM 02 01 (latest version) guideline and European CE. **This supersedes single/multiple standards mentioned at any other places in the tender specification involving item/system/capacity etc.** The imported products should be of **one standard** only. All indigenous items should be of high quality and to be compatible to the main system.

The system comprises of

1. Secondary Oxygen Manifold and Emergency oxygen manifold with automatic control panels
2. Nitrous Oxide Manifold and Emergency NO₂ Manifold with automatic control panel
3. Medical Air Supply System (4 Bar & 7 Bar) complete.
4. Medical Vacuum (suction) Supply System Complete.
5. Distribution Piping Complete with Accessories.
6. Area Valve Service System.
7. AGSS system Complete
8. Alarm Systems (Master & Area)
9. Gas Outlets with Probes
10. Bed Head Panels
11. Other associated & Optional works

Scope and Technical Specification:

1. Oxygen Supply System

1.1 Fully Automatic Oxygen Control Panel (Imported):

Automatic control panel should be constructed in accordance with the requirement of international standards. The fully automatic oxygen control panel should comply with HTM 02-01/NFPA 99C/DIN/EN/ISO-7396-1 standards. It should be European CE Certified or UL listed.

The manifold assembly should provide two stages of pressure regulation. A single stage primary regulator, one for each cylinder bank should be used to initially reduce cylinder pressure and two single stage pressure regulators should be provided in the control cabinet for final delivery pressure regulation. One delivery pressure regulator in service and one should be ready for service in a standby mode. The Manifold control panel should be digital/Analogue, fully automatic type and switches from "Bank in Use" to "Reserve bank " without fluctuation in delivery supply line pressure. Changeover should be performed by electrically/pneumatically operated valves contained in the control cabinet. In the event of an electrical power failure the valves should automatically open

to provide an uninterrupted gas flow. It should be 100% automatic and should not require manual adjustment. Instruction for changing the cylinders should be clearly identified on the front of the control panel.

All functional components should be enclosed in corrosion resistant robust material. All components inside the Control Panel like Pressure Regulators, piping and control switching equipment should be cleaned for Oxygen Service and installed inside the cabinet to minimize tampering with the regulators or switch settings. The Control Panel shall include two pressure relief valves, one high pressure 350 psi and one low pressure approx.75 psi. The heavy duty control panel should be provided with a flow capacity of 1500 or more LPM at 50 to 60 psi.

The Automatic Control Panel should be installed in such a way to meet the peak flow requirement of the Hospital/Institute (If the requirement is more than flow capacity requirement automatic control panel the bidders has to supply 02 numbers of Automatic Control Panel and design the system in such a way to meet the flow requirement of respective institute) Control panel should have Alarm reset switch/Mute /acknowledgement switch to control and monitor the alarm indications by the operator.

1.2 Oxygen Manifold Supply System (without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders. Manifold shall consist of two high pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASME incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high pressure shut off valve. Oxygen Manifold should consist of 2 rows of respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3500 psig. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non - return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing chains which should be galvanized

1.3 Emergency Oxygen Manifold (without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders. Manifold shall consist of two high pressure header bar assemblies to facilitate connection of respective numbers of primary and secondary cylinder supplies. Each header bar shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASME incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high pressure shut off valve. Oxygen Manifold should consist of 2 rows of

respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3500 psig. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non -return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing chains which should be galvanized.

1.4 Oxygen Flow meter with Humidifier Bottle

Back Pressure Compensated flow meter for accurate gas flow measurement with following features:

- A) Control within a range of 0-15 LPM.
- B) It should meet strict precision and durability standard.
- C) The flow meter body should be made of brass chrome plated materials.
- D) The flow tube and shroud components should be made of clear, impact resistant polycarbonate.
- E) Flow tube should have large and expanded 0-15 LPM range for improved readability at low flows.
- F) Inlet filter of stainless steel wire mesh to prevent entry of foreign particles
- G) The humidifier bottle is made of unbreakable & reusable polycarbonate /polysulfone material autoclavable at 121 degree centigrade .
- H) Humidifier Bottle should be covered under warranty & CMC.
- I) should be BIS/CE certified/ UL Listed

1.5 LIQUID MEDICAL OXYGEN STORAGE TANK-20KL CAPACITY

The double walled Vacuum Insulated Evaporator shall be constructed of stainless steel inner vessel contained within a carbon steel outer vessel. The annular space between the vessels shall be filled with non-inflammable perlite insulation material to insulate under vacuum. The VIE should be self pressurizing type by partial evaporation of liquid oxygen through a pressure building coil by a non ferrous imported pressure regulator. The vessel shall be supplied as a functional whole with all materials of construction & the cleaning regime suitable for medical grade liquid oxygen.

Quantity	:	1 No.
Installation	:	Outdoor
Type	:	Double walled, vertical
Capacity	:	Minimum 20000 ltrs water capacity
Design Code	:	ASME Sec.VIII Div.I Latest Edition/EN 13458-2 Annexure – C/AD2000 MARKBLATTER 2004 Edition
Max working pressure	:	17 Bar G
Design temperature	:	- 196°C to + 50°C
Hydraulic test pressure	:	26 bar G
Type of Insulation	:	Vacuum, Perlite filled

Safety Valve Set pressure	:	17 Bar G (dual safety valve with three way diverter valve)
Bursting Disc Set pressure	:	23 Bar G (Bursting disc)
Standard fittings	:	Pressure rising coil, Pressure building regulator of adequate capacity and size, dual safety valve with imported three way diverter valve, bursting disc., pressure gauges, liquid over flow line, Liquid level gauge and adequate numbers of extended spindle glove valve etc.
Maximum Evaporation Rate	:	<0.35% of net value.
Material of Construction	:	Inner shell and wetted parts of SS-304 Outer shell of CS ASTM A 516 Gr.70/CG3412002 EN13455 S275/S355
Joint Efficiency	:	100%
Radiography	:	100% for inner, for outer spot
External piping	:	From LMO Tank to Vaporizer SS304 From Vaporizer to Inlet of Pressure Reducing Station SS304 From Outlet of Pressure Reducing Station to Main header Copper
Cryogenic Valves	:	Non Ferrous .
Cryogenic Safety Valves	:	Imported
Pressure Building Regulator	:	Non ferrous .
Leak Detection test	:	Helium Leak Detection
Painting	:	Primer and finish with White RAL 9010
Inspection	:	By 3 rd party (SGS/LLOYDS/TUV)
Cleaning	:	Degreasing for Oxygen Service and Pressurize with Nitrogen.
Withdrawl rate	:	1000 Cum hr. at 12 Bar G

Accessories :

LMO Tank along with P & ID shall be fitted with the following accessories:

- Top Fill Valve
- Bottom Fill Valve
- Liquid charging line blow valve

- Liquid Delivery valve
- Overflow Valve
- Gas blow valve
- Filling Coupling
- Vaporizer Coupling
- Liquid Level Gauge (Dial 100 mm)
- High Level Valve
- Equalizing Valve
- Low level Valve
- Pressure Gauge (100mm dial, Range 0-25 kg/sq.cm)
- Pressure Gauge Isolation Valve
- Pressurizing Valve
- Pressurizing Coil
- Filter
- Pressure Regulator
- Economizer
- Check Valve
- Evacuation Port
- Vacuum Gauge Connection Port/Vacuum probe valve.

SAFETY FITTING:

- Two safety valves for inner vessel fitted on pipe line with flow divert valve.
- Rupture disc for inner vessel
- Safety valve for inlet pipeline
- Safety valve for pipeline of pressurizing evaporator
- One rupture disc/safety device on outer vessel.

SUBMITTALS:

The Liquid Medicals oxygen tank shall accompany the Original Quality Test Certificate covering following documents:

- Approvals letter from CCOE along with approved drawing from CCOE.
- Approval letter from CCOE for use of cryogenic vessel(s) at site.
- Certificate from the authorized inspection agency.
- Heat chart for pressure parts.
- Dimension checks parts.
- Dished End reports.
- Mechanical properties test reports.
- Visual inspection report.
- Radiography examination report.
- Liquid penetrant examination.

- Cleaning inspection report.
- Hydro-pressure test report.
- Pneumatic pressure test report.

Inner vessel rub-off sheet.

Material test reports for pressure gauges, level gauge etc.

NOTE :

- The date of manufacturing of Liquid Medical Oxygen Storage tank shall not be prior to Jan 2014
- All valves shall be long stem valves with SS body.
- Contractor to provide technical specifications for all the accessories in their offer.

c **ATMOSPHERIC VAPORIZER:**

Continuous duty atmospheric vaporizing of minimum flow capacity 1200 NM³/hr. along with required/interconnecting pipelining from VIE to Vaporizer, Vaporizer to Pressure reducing station and to gas supply header. Scope of work should cover provision of all required supports, valves, accessories etc.

Duty Cycle	:	Continuous
Quantity	:	One
Capacity	:	Minimum 1200 Nm ³ /hr
Type	:	Vertical
Fluid	:	Liquid Oxygen
Operating Inlet Temperature	:	-196°C
Operating Outlet Temperature	:	Not less than 10 deg Centigrade below ambient
Max Operating Pressure	:	25 Bar G
Pneumatic Test Pressure	:	30 Bar G
Material of construction	:	Aluminium alloy
Design code	:	ASME section VIII Division 2000

d The tendered shall submit duty cycle and design details pertaining to the vaporiser including overall dimensions, type/size of flanges & tubes etc.

e. **PRESSURE REDUCING STATION:**

Pressure reducing station with by pass arrangement comprising of Pressure regulators designed for flow rate of minimum 2000 LPM along with inlet –outlet pressure gauges, necessary valves & filters and piping connection.

-Inlet pressure 17 Bar G

-Outlet pressure 0-10 Bar G

As liquid oxygen is the primary source, cylinder bank be designed as per flow rate calculations.

The installation and commissioning of LMO Tank system shall be inclusive of connection of LMO tank with Automatic Control Panel and all installation, material (Copper Pipes, all Valves, fittings, Vaporiser & Pressure Reducing Station etc) trenches, barricades, fire fighting arrangements and signage etc.

2. NITROUS OXIDE SYSTEM

2.1 Fully Automatic Nitrous Oxide Control Panel (Imported)

The fully automatic N₂O control panel should comply with HTM 02-01/ NFPA 99 C/ EN /DIN/ISO 7396-1 STANDARD. It should be European CE Certified or UL listed. The manifold assembly should provide two stages of pressure regulation. A single stage primary regulator, one for each cylinder bank should be used to initially reduce cylinder pressure and two single stage pressure regulators should be provided in the control cabinet for final delivery pressure regulation. One delivery pressure regulator in service and one should be ready for service in a Standby mode. The Manifold control panel should be digital/ Analogue, fully automatic type and switches from “Bank in Use” to “Reserve bank “ without fluctuation in delivery supply line pressure. Changeover should be performed by electrically/pneumatically operated valves contained in the control cabinet. In the event of an electrical power failure the valves should automatically open to provide an uninterrupted gas flow. The manifold should not require any manual resetting or adjustments after the replacements of the depleted cylinders. All functional components should be enclosed on fire resistant, robust synthetic polymer/SS. The Control Panel shall include two pressure relief valves, one high pressure approx.350psi and one low pressure approx.75 psi.

The control panel should also have heaters to prevent ice formation on the regulators at high flow rates. The Control Panel should be made to provide Heavy Duty and have a flow capacity of 500 LPM or more at 50 to 60 psi. The Automatic Control Panel should be installed in such a way to meet the peak flow requirement of the Hospital/Institute (If the requirement is more than flow capacity requirement automatic control panel the bidders has to supply 02 numbers of Automatic Control Panel and design the system in such a way to meet the flow requirement of respective institute)Control panel should have Alarm reset switch/Mute /acknowledgement switch to control and monitor the alarm indications by the operator.

2.2 Nitrous Oxide Manifold (Without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders. Manifold shall consist of two high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with respective number of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASME incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high pressure shut off valve. The manifold should be hydraulically tested to 3500 psig. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The cylinder should be locked with the help of cylinder brackets and fixing chains which should be galvanized.

2.3 Emergency N2O Manifold (Without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders. Manifold shall consist of two high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as per IS 3224/ BS/ ASME incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high pressure shut off valve. Nitrous oxide manifold should consist of 2 rows of respective numbers of cylinders. The manifold should be hydraulically tested to 3500 psig. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non – return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing chains which should be galvanized.

3. MEDICAL AND SURGICAL AIR SYSTEM (Package Unit - Imported)

Air-cooled **Oil-Less** compressors for continuous duty application with highest output of compressed air, low power consumption and very low vibration resulting in low noise level. The medical air plant shall fully comply with the requirements of the HTM 02-01/ NFPA 99C/EN/DIN/ISO 7396-1. It should be European CE/ UL listed. (In-case of NFPA 99c the control panel of plant must be UL Listed and Undertaking from manufacturer for this tender reference must be submitted for using the same control panel in the system offered)

3.1 Air Compressor Modules

It should be **Oil-Less Screw Compressors /Scroll Compressors** to produce the plant output of {**minimum Liters Per Minutes (LPM) Plant capacity** } as mentioned in BOQ of respective institute as primary and same as standby.

Medical quality air shall be delivered at a nominal pressure of 400 kPa (4 bar) and 700kPa(7bar) gauge for supply of the hospital medical air and surgical air. Compressor plant should be designed in such a way that compressors will switch on in a sequential manner as per flow demand. The compressors should be standalone ones with independent power supply. Each Compressor should be suitable for both continuous and frequent start/stop operation at a nominal plant pressure of 10bar or more. The duty compressors shall be automatically rotated by the plant control system to ensure even wear. Compressors shall be supplied and installed in such a way after cooler with a quiet running fan to maximize cooling and efficiency. Each desiccant dryer shall be provided with a dew point sensing switch that shall provide an alarm on the plant control panel and central hospital alarm system when the water concentration in the delivered air rises above the limit. Duplex desiccant dryer and filtration modules shall be provided with three or more individual stages of filtration as follows:

- Stage 1: Coalescing filter upstream of the desiccant dryer for removing liquid water particles down to 1micron.
- Stage 2: Particulate filter after the desiccant dryer for dust protection and removing particles down to 1 micron.
- Stage 3: Bacteria filter for removing particles down to 0.01 micron. Purity should be tested as per the **American Pharmacopeia / European Pharmacopeia** standard. The plant control and power management system shall monitor the safe operation of the plant, providing signal into the alarm system as per the requirements of the standard.

Pressure Reducing Station: for 4 bar and 7 bar should fully comply and meet with the requirements of the standard. Simplex pressure reducing station shall comprise as in-line pressure regulator, with downstream pressure gauge. Isolation valves and pressure release valves should be provided as per the standard. Duplex pressure reducing station to have two branches, connected to the MGPS in parallel in order to allow maintenance on the components of one branch, while the gas flow is maintained in the other branch. Ball Valves - Full bore which operate from fully open to fully closed position with a quarter turn of the handle. Complete pressure reducing station with base plate mounted for ease of installation. Padlocks available to allow locking of the valves in both open and closed positions and must have easy to read pressure gauges. Base plate mounted and supplied with copper stub pipes for ease of installation using inert jointing procedures.

The compressor system should have-

1. Intake filter Check Valve Delivery pipe
2. Mounting on air tank along with all standard fittings viz. safety valve, pressure gauge, delivery valve, drain valve etc.
3. Bidder shall provide all electric control panels, starters etc required for proper functioning of motor.
4. Desiccant Air Dryer – 2 nos.(Duplex)
5. 2-Stage or more Breathing Air Filters – 2 sets(Duplex)
6. Outlet pressures for drills/equipment and ventilators should be a minimum of 7 bar and 4 bar respectively.
7. Duplex pressure reducing station

The compressor should be heavy duty, reliable with long MTBF. Each compressor cylinder is to be protected by a temperature switch, which will stop the drive motor and provide an alarm signal in the event of abnormal discharge air temperature. Each compressor module should include an inline filter with particle retention of 10 microns, inlet isolation valve, discharge isolation valve, and pressure relief valve. The capacity should be capable to take care of total load of all the outlets.

3.2 Vertical Air Receiver

Total air receiver capacity shall be at least 50% of the primary plant capacity in 1 minute in terms of free air delivered at normal working pressure. Each air receiver shall be protected by a pressure relief valve, a fusible plug and include a pressure gauge with isolating valve and a drain cock. The corrosion resistant coated receiver is to be equipped with tested safety pressure relief valve, sight glass pressure gauge, automatic drain, three-valve by-pass and source isolation valve. Should be fabricated as per ASME/BS/ISO

3.3 Air Treatment Module

The air treatment module should include dual dryers, dual filtration system and a dew point transmitter with local audible and visual signals and dry contacts for remote monitoring. The components should be mounted on a common base with interconnecting copper/brass piping and upstream and downstream isolation valves. The isolation valves must allow either set of components to be serviced without shutting down the system. Dryers should be of heatless desiccant design and sized to provide for the peak calculated demand. The desiccant dryers should be equipped with dew point dependent switching feature to minimize the need for purge air. The dual filtration system should remove liquid and particulate matter, consisting of 0.5microncoalescing filters with differential pressure indicators and automatic drain, airline pressure regulators with gauges, final pressure relief valve, and sampling valve. Each bank should consist of three stage treatment. Digital dew point monitor is to be supplied with alarm contacts as per requirement of the standard.

3.4 System Controls

The "Continuous on Demand" feature will stop the operation of the motors during periods of lower no demand. The control include individual self-protected combination motor controls with short circuit protection, single phase and thermal overload protection, individual control circuit transformers with fuseless primary and secondary protection, pressure sensors, temperature switches with reset buttons, and an electronic controller to automatically change the operating sequence of the compressors. The cabinet shall have status display to include system pressure, dew point pump operation, accumulated time, maintenance interval, fault conditions, and silence button, lighted Hand-Off-Automatic selector switches and safety disconnect operating handles. All required local alarm functions shall be integrated in to the packaged system. The system should be designed to function even if the programmable controller fails.

3.5 Accessories

Accessories including for job site installation such as inlet and discharge flexible connectors, vibration mounting pads, and source isolation valve should be supplied.

All the filters should be covered under warranty period and CMC Period.

4. VACUUM SYSTEMS (Package unit - imported)

It should be European CE certified or UL listed. (In-case of NFPA 99c the control panel of Plant must be UL Listed and Undertaking from manufacturer must be submitted for using the same control panel in the system offered)and should comply with HTM 02-01/ NFPA 99C/EN/DIN/ISO 7396-1

4.1 Vacuum Pump Module

It should be **Oil Sealed Rotary Vane Type** to produces the plant output of **{minimum Litrs Per Minutes(LPM) Plant capacity } as mentioned in BOQ of respective institute as primary and same as standby** Designed flow capacity should be minimum of LPM capacity as mentioned in BOQ of respective institute. The vacuum plant shall comprise air-cooled, oil lubricated rotary vane vacuum pumps suitable for both continuous and frequent start/stop operation at inlet vacuum levels between 500mmHg and 660 mmHg. The control system should normally employ automatic rotation of the lead pump to maximize pump life and ensure even wear. Vacuum pump inlets shall include a wire mesh filter and integral non-return valve to prevent oil suck back and pressure increases in the vacuum system. Each vacuum pump shall be fitted with anti-vibration pads between the pump foot and mounting frame. The plant shall be fitted with duplex bacteria filter system.

4.2 Vacuum Receiver

The vacuum receiver shall be made of rust free corrosion resistant steel and fabricated as per ASME/BS/ISO for a vacuum pressure of 760mmHg. It should include bypass valves,manual drain valves, vacuum gauge. Vacuum reservoir shall have total volume of at least 100 %of plant output in one minute in terms of free air aspired at normal working pressure.

4.3 System Controls

The control include individual self-protected combination motor controls with short circuit, single phase and thermal overload protection, individual control circuit transformers with fuseless primary and secondary protection, pressure sensors, temperature switches with reset buttons, and an electronic controller to automatically change the operating sequence of the compressors. The system should have a status display to show the system pressure, elapsed time, maintenance interval, fault conditions, and silence button, lighted Hand-Off-Automatic selector switches and safety

disconnect operating handles. All required local alarm functions should be integrated into the packaged system. The circuitry should be designed so that the audible signal can be silenced and the visual indicator will remain until the fault has been cleared and the reset button resets. Local alarm functions should be enunciated for reserve pump in use.

4.4 Bacterial Filters

The filters should be designed for removal of solid, liquid and bacterial contamination from the suction side of vacuum pump systems, preventing damage to the pump and the potential biological infection of the surrounding environment. The dryer should be particulate filter dryer with ability to remove particles as small as 1micron.Each individual filter shall have the capacity to deliver full design flow such that one set is designated duty and the other will be standby. Bacteria filters shall have efficiency at least99.999% when tested by the sodium flame method in accordance with BS 3928:1969/as per required standard utilising particles in the 0.02 to 2 micron size range. The pressure drop across each clean filter at 50% of the system design flow should not exceed 25 mm Hg (3 kPa) at a vacuum of 475mm of Hg (63 kPa). Bacteria filters shall be marked with the legend 'Bio-Hazard'.Each bacteria filter shall be provided with a transparent sterilizable collection jar to collect condensate. The total water capacity of the pressure vessels shall be at least 100% of the designflow rate of the plant in 1 minute in terms of free air aspired.

4.5 Accessories

Accessories included for job site installation are inlet and discharge flexible connectors, vibration mounting pads, and source isolation valve, inlet check valve, oil temperature gauge, thermal malfunction switch and vacuum control switch. Flexible connectors on inlet and exhaust of each pump, exhaust tee with union as well as copper tubing with Shut-off-cock for gauge and vacuum switch etc.

All the filters should be covered under warranty period and CMC Period.

5. Ward Vacuum Units

It must consists of the following:-

1. 1no of Suction Regulator and 1no of 1000 ml polysulfone /polycarbonate collection jar.
2. Suction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti-overflow safety device. Should have wide membrane continuous suction controller
3. Should have vacuum levels: 0-760 mm of Hg
4. Should have vacuum gauge fitted with a protective bumper device.
5. Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
6. Must have central adjustment knob with a color coded for 0 to 760 mm of Hg. Should have Polysulfone/polycarbonate 1000ml safety jar, autoclavable at 121° C at 5mins, unbreakable, fitted with an anti-overflow safety device and equipped with a plastic antibacterial filter. It should be totally transparent, to ensure perfect sucked liquid visibility.

6. Theatre Vacuum unit for OT

It must consist of the following: -

1. 1no. Suction Regulator and 2nos. 1700ml or more polysulfone/ polycarbonate collection jar and both to be mounted on a trolley.
2. Suction Regulator: Suction regulator should be supplied with a safety jar, including an anti-bacterial filter and an anti-overflow safety device. Should have wide membrane continuous suction controller
3. Should have vacuum levels : 0-760 mm of Hg
4. Should have vacuum gauge fitted with a protective bumper device.
5. Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
6. Must have central adjustment knob with a color coded for 0-760 mm of Hg. Should have polysulfone/polycarbonate safety jar, autoclavable at 121° C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.
7. Collection jar should be totally transparent, to ensure perfect sucked liquid visibility.

7. AGSS (Anesthetic Gas Scavenging System) Plant (Package Unit - Imported)

Duplex Anaesthetic Gas Scavenging System (AGSS) of minimum 1400LPM, should be European CE Certified or UL listed. It shall conform to HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1. One pump working and one stand by and vice versa. The package should consist of two dry rotary vane vacuum pumps/Claw technology, a control panel, and mounted on a common base frame. AGSS pump: AGSS pump shall operate completely dry permanently lubricated and sealed. Each pump should be completely air cooled and have absolutely no water requirements. Duplex system in-line non-return valves should allow individual pump servicing. Active anaesthetic gas scavenging systems should be designed to safely remove exhaled anaesthetic agents from the operating environment and dispose of them to atmosphere from the highest point of the hospital building, thus preventing contamination of the operating department and providing a safe and healthy workspace for the personal. AGSS design should be dependent upon flow rate and pressure drop characteristics of the individual components of systems. It is essential that terminal units, remote controls (If required) and pump units work in synchronized manner after connection of workstation to the AGSS System. Installation should be on roof top/suitable location. Piping, Non-Return-Valves (NRVs), and inlet nozzle should be suitably placed. Connecting hose suitable to fit with anaesthesia workstation should be provided.

8. DISTRIBUTION PIPING

8.1 Piping specifications

Copper pipe should be as per standard BS: EN 13348:2008/ ASTM B819 standards, Solid drawn, seamless, deoxidized, non-arsenical, half hard (hard can be accepted only for sizes 54mm or more), tempered and degreased copper pipe conforming to the standard. All copper pipes should be degreased & delivered capped at both ends. The pipes should be accompanied with manufacturers test certificate for the physical properties & chemical composition. Copper pipe must have reputed third party inspection certificate (Eg. Lloyd's or TUV or SGS). Fittings should be made of copper and suitable for a working Pressure of up to 17bar and especially made for brazed socket

type connections. The isolation valve body shall be made of chromium plated brass with non lubricated ball-type. All valves shall be pneumatically tested for twice the working pressure and factory degreased for medical gas service. Copper fittings should comply with EN 1254:1 factory degreased and brazing filler metals should comply with EN 1044. Fitting should be degreased, individually packed for medical use. The minimum thickness of copper pipes of 35mm and above outer diameter, should be 1.2mm and the thickness of copper pipes less than 28mm outer diameter, should be 1mm as mentioned in respective Institute's BOQ.

8.2 Installation & testing

Installation of piping shall be carried out with utmost cleanliness. Only pipes, fittings and valves that have been degreased and fittings shall be used at site. Pipe fixing clamps shall be of nonferrous or non-deteriorating plastic suitable for the diameter of the pipe. Inert gas welding technique should be used by passing oxygen Free Nitrogen Gas inside the copper pipes during silver brazing, in order to avoid carbon deposition inside the copper pipes. Only copper-to-copper joints are permitted on site except threaded or flanged joints may be made where pipelines are connected to items such as valves and control equipment. No flux shall be used for joining Copper to Copper joints and on for joints made on site. Copper to copper joints shall be brazed using a 5% silver-copper phosphorous brazing alloy CP104. A total of 5 joints shall be cut out for examination to establish the quality of the joints being made on site. The insides shall be clean and free from oxides and particulate matter and the minimum penetration of the brazing alloy at any point shall be three times the wall thickness of the tube. If the joints examined do not conform to these requirements, then adjacent joints shall be cut out and examined until the extent of faulty workmanship has been made good. Copper-to-brass organ metal joints shall only be made under controlled conditions off site. The joints are ordinarily used to join short copper pipe tails to brass, gunmetal or bronze fittings to permit their connection into the pipeline. The sub-assemblies shall be degreased and individually sealed in bags or boxes before delivery to site. Adequate supports should be provided while laying pipelines to ensure that the pipes do not sag. Suitable sleeves shall be provided wherever pipes cross through walls / slabs. All pipe clamps shall be non-reactive to copper. After erection, the pipes are to be flushed with dry nitrogen gas and then pressure tested with dry nitrogen at a pressure equal to twice the working pressure or 150 psig, whichever is higher for a period of not less than 24 hours.

Length and quantity of individual items (Copper pipes, AVSUs, Alarm panels, Isolation valves, Outlets, pendants etc.) are mentioned. However quantity will be calculated and paid at actuals. Bidder should quote unit price for all the items as detailed **Maximum interval between supports (Horizontal and Vertical)**(12mm Pipe - 1.5m, 15mm pipe - 1.5m, 22mm pipe - 2m, 28mm pipe-2m, 35mm pipe-2.5m, 42mm pipe -2.5m, 54mm pipe - 2.5m, 76mm pipe - 3meter)

8.3 Painting

All the pipes from manifold/plant upto the outlets should be painted with two coats of synthetic enamel paint and colour codification should be as per standards followed and with consultation with competent authorities of the Institute.

9. GAS OUTLETS (IMPORTED)

Terminal Units (Gas Outlets) with probes/Adaptors for O₂, N₂O, Compressed Air 4, Air 7, AGSS, Vacuum & CO₂ (CO₂ can be optional depending on the requirement) The Medical gas outlets shall conform to HTM 02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1. Front Loading Type Terminal Outlets should be designed to dispense medical gases (or an inlet for medical vacuum) to the secondary equipment (flow meters, Suction regulators, etc.) at the point of use and is gas specific so that secondary devices cannot be "attached" to the wrong gas. When not in use the gas in a non-flowing state within the Outlet (Terminal unit) sealed by "O" ring. The adapter when inserted pushes the poppet inside and the gas starts flowing and sealing is ensured by the "O" ring or a seat. The Outlets are Quick Connect Type and gas specificity is accomplished by "Pin indexing."

The outlets should have following features:

- Push to insert and press-to-release mechanism for probes.
- Allows plugging of probes from front.
- Self-sealing valve on disengaging the probe (Quick disconnect)
- Smooth quite action.
- Non return valve for on line servicing/ repairing
- Indexed to eliminate inter-changeability of gas services
- Color-coded gas specific front plate
- Totally leak proof, safe & easy to operate
- Configurations possible: surface, flush & Bead-head.
- Outlet should be European CE certified or American UL listed
- All outlets should have respective label (i.e.O₂/N₂O/CO₂/Air4/Air7/Vacuum/AGSS/etc.) displayed accordingly.

10. AREA VALVE SERVICE UNIT

Area valve service units should fully comply and meet with HTM 02-01/NFPA99C/EN/DIN/ISO7396-1, It should provide a zone isolation facility for use either in an

emergency or for maintenance purpose The Area Valve Service Unit should incorporate a ball valve with NIST/else connectors either side mounted in a lockable box with emergency access. It should be reliable and easy to operate and must have NIST connectors facilitate easy purge, sample & pressure testing and emergency supply system. Medical gas/vacuum services should be fixed copper, piped to and from their respective area valve service units. A color coded service identity label should be fitted behind the valve handle.

The unit should provide a zone isolation facility. Gas Flow direction should be indicated. The box shall be made from extruded aluminium to prevent corrosion. All wetted parts (except seals and gaskets) should be brass or copper. Each unit assembly should be factory tested for gas tightness. Rubber pipe grommets should be provided to ensure

any leaking gas does not escape from the unit into a wall cavity. All visible aluminum surfaces should be powder coated.

11. ALARM SYSTEM

11.1 Master Alarm (Imported)

Should be European CE Certified or UL listed under Medical Devices Directive. Complies with HTM 02-01 / NFPA 99C/EN/DIN/ ISO 7396-1 Standards. Each Master Alarm should be modular in design and be fitted with required number of master alarm modules. The master alarms should be capable to monitor minimum 40 Point. Each point represents an alarm condition that the source equipment might have. When an alarm condition exists, a red light flashes and the audible alarm sounds. If several alarm conditions occur simultaneously, the most recent alarm light should flash, while the other alarm lights should remain lit. When an alarm condition is created, an audible alarm should be actuated. A dry contact module should be available to interface with a building management system. The box material should be of gauge steel of requisite thickness and equipped with mounting brackets. The emissions from alarms should conform with EMC standards. Master alarm management system should be designed to display alarm conditions from the source supply units indicating the broad status of the source equipment and manifolds as well as the master distribution status from the source supplies. Depending on the alarm priority, a visual and audible alarm should be initiated to indicate an alarm condition. Each panel shall display and/or input up to forty point alarms. Panel should be ready to use with BMS system.

The master alarm must be able to monitor the following source alarm conditions.

- Oxygen Source Empty/Fault
- Oxygen Cylinder Bank Empty/Fault
- Oxygen Emergency Bank Empty/Fault
- Air Compressor Faulty/Operation
- Vacuum Pump Faulty/Operational
- Vacuum Deficiency Vacuum Reservoir
- And Other MGPS Signals & Alarms

Bidder shall be responsible for all cabling from local alarm panels to master alarm panel

11.2 Medical Gas Area Alarm (Imported)

The medical gas central alarms should be capable of monitoring up to 5 medical gas services(As specified in BOQ of respective institute) by means of pressure sensors which detect deviations from the normal operating limits of either pressure or medical vacuum. The area alarm should have a digital/analogue display of pressures. The medical gas area alarm should fully satisfy the HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1 requirements and should be European CE Certified or UL listed. An audible warning should sound simultaneously with any failure indication and a mute facility should be provided. "

12. Line Isolation Valves (Imported)

The Lockable line valves must European CE mark/UL listed and complies with HTM 02-01/ NFPA99 C/EN/DIN/ISO 7396-1 standard.

13. Supply of O2 Cylinders – Class D Type

Should be as per BIS/IS/ASME Standard.

14. Supply of N2O Cylinders – Class D Type

Should be as per BIS/IS/ASME Standard

15 Supply of CO2 Cylinders – Class D Type

Should be as per BIS/IS/ASME Standard

16. Horizontal/ Vertical Bed Head Panel –Imported

It shall confirm to HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1. The design should be approved by the respective institute before installation and it is responsibility of the bidder after getting order they have to discuss with respective institute and finalized the Bed Head Panel(Vertical/Horizontal) as per site condition.

It should have following features:-

Efficient, Safe & Robust design in extruded aluminium section. Smooth curved surfaces, and choice of base colour and fascia plates. Unit should have integrated rail system to mount accessories. The headwall system should be constructed of aluminium extrusions joined together to form a carcass to suit the particular application. Unit should be factory assembled for electrical and mechanical components. Segregation of services i.e. Low voltage supplies, High Voltage supply and Medical gases should be maintained throughout. Front fascia plate should be removable individually to access for respective service. Bed space management system with optional equipment rail. With all Equipment Rail mount

Accessories.

All down drops should be installed at one end preferably & Vertical drop installed at one end should be covered with Aluminium boxing with matching color. Each bed-head unit shall be supplied with electrical and electrical outlets pre-fitted, wired and certified. (Wired up to the distribution box provided with leakage protection & proper earthing arrangements)

Note: Imported Gas Outlets quantities are already taken in consideration of quantities of respective outlets in BOQ

Facility per unit

Oxygen – 2

Vacuum – 2

Medical Air-1

Holder for vacuum collection jar –1

Nurse call switch – 1 (not in the scope of MGPS Vendor only space for same has to provide)

Lamp with flexible LED lighting – 1

Infusion pump mount pole with adapter for mounting at least two infusion pumps
 5 /15A combined Electrical outlets – 8 Nos. or more
 RJ-45 socket/ Ethernet -01
 Two spare spaces
 Monitor Bracket

17. High pressure tubes for O2, N2O, Compressed Air,& Vacuum

It should be colour coded for individual services i.e. white for Oxygen, Blue for N2O and Yellow for Vacuum, Black for air. Antistatic rubber tube should be as per ISO standards. It should be CE marked/UL Listed imported. (The 200m Hose- Gas wise requirement should be taken from respective institute before supply total lengths should be 200m inclusive of all type. If institute requires more than payment will be made on actual basis as per finalized BOQ rate)

18. Electrical Wiring with Electrical Panels –

All wiring inside the Manifold Room and Plant room required for MGPS equipment and General electrification. Institute will provide one point supply only. Other are under the scope of bidder. All the work should be as per BIS/CE standard and material used should be reputed make only.

19. CARBON DIOXIDE SYSTEM

Medical CO2 Manifold 2 + 2 Primary & 1+1 Standby with Class-D type Cylinders

The Modular Manifold supply system shall provide carbon dioxide piped distribution system. The Modular Manifold system should be in such a way that it increases flexibility and allows easy enlargement of the manifold capacity in case of future expansion. Should be complies with HTM02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1 standard.

Fully Automatic Control panel for CO2 System (Imported)

The Manifold Control System should supply any type of medical gas from both left and right hand manifold banks. Operation and performance criteria should fully satisfy the requirements of HTM02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1 standard. The fully automatic CO2 control panel should comply with the standard. It should be European CE Certified or UL listed. The Manifold Control System shall supply on uninterrupted flow of 500 L/min. to a 400 k Pa (4bar) distribution system. Either the left or right hand manifold bank may be designated "Duty" and should automatically changeover to supply the distribution system from the "Standby" bank when pressure in the "Duty" bank falls to a predetermined level.

APPROVED MAKES

1	Automatic Oxygen Control Panel	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech
2	Automatic Nitrous Control Panel	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech
3	Air Compressor	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech/Atlas Copco/Powerex

4	Vacuum Unit	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech/Powerex
5	AGSS	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech/Powerex
6	Copper Pipe	Maxflow/Rajco/Precision
7	Alarm	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech
8	Isolation valve	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech
9	Gas Outlets	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech
10	Bed Head Panel	Amico/Allied Health care/Becon Medaes/Drager/Ohio Medical/Pneumatech Medical/Tritech/Trilux/LM Medical/Medepha
11	Electric Control Panel	L & T/ SIEMENS/ SCHNEIDER
12	Liquid Oxygen Tank & Vaporizer Pressure Reducing Stn & accessories	Inox/VRV/Cryolor

Third party quality certification of the imported MGMS equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted as “Certifies that the MGMS equipment meets the technical specification and BOQ of the tender document”..

TECHNICAL SPECIFICATIONS

Modular Operation Theatre

1 WALLS & CEILING CONSTRUCTION:

The prefabricated construction for 1.60 mm thick AISI-304 Stainless Steel backed by 12mm thick Gypsum board OR it should be Double skinned panel of 0.8mm thick 304 Grade Stainless Steel sheet each. The double skinned panel shall be sandwiched with core consisting of rigid polyurethane foam, which has been injected under high pressure, with a minimum density of 40 kg/m³. with Silicon sealant to provide seamless operating room. The individual wall panels shall use the tongue and groove technology for joining two panels, no welding should be allowed.

The ceiling suspension from concrete ceiling should be as:

Suspension elements : Suspension bracket with tension spring
Suspension Height: Continuously adjustable from 250 to 1100 mm
Stability: Permanent and non-stop after adjustment.
Material High quality galvanized steel

The external wall of the room shall be constructed with solid brick and mortar by the hospital authority. Clearance between inner panel and outer wall preferably should be 40-55 cm to allow the maintenance personnel for service. This closed space should be flushed continuously to eliminate dust and bacterial accumulation. In order to create a smooth uninterrupted surface between adjacent panels, thereby preventing the risk of the accumulation of dust and bacteria in gaps, the panel should be produced in a single full height floor-to ceiling piece. The total distance between inside and outside surfaces of the operating room should be sufficient for flush mounting of the equipment. All the sharp edges and corners of the OT room should be rounded /coved to avoid bacterial contamination. The wall panel and Ceiling design and construction should be strong enough to allow for the installation and support of all equipment and should have provision of opening required for the installations without affecting rigidity and strength. Access Boxes should be fitted to the rear of all wall-mounted equipment to enable maintenance to be carried out from outside the operating room. Wall paneling should be of fire protection or Reaction to fire class-1 norm. Room lighting, air supply inlet, Ceiling Service units, return air outlets etc should be integrated with SS metal ceiling system. The individual panels except those at the edges should be removable individually. The Walls and suspended Ceiling should be hermetically sealed. All the four corners should have return air duct outlets and grill for the same made of SS with the color choice to suit the hospital's choice. The system should afford the maximum versatility at the planning stage and flexibility during erection, ensuring openness to future alternations and trouble-free maintenance. During the installation of first the structural parts and subsequently the finishing elements, the system should ensure perfect integration of technical networks and allow ample operational flexibility at the construction site. The clean, dry installation method should enable optimum programming of the various work phases, allowing optimization of the installation of technical systems and any necessary alterations to be made – right up to checking and final testing of the installed systems – before the modules are sealed.

The cavity between the inner and outer walls should be left with minimum obstructions for the possible addition of equipment at a later date and to enable services, pipes, conduits etc, to be run within the cavity. The wall panel should be fixed to the brick wall with supports/sub-frame on which individual wall panels will be mounted. The wall panel should be fixed to the brick wall with supports. All joints and cavities should be filled with Metallic Epoxy sealer and sanded flush to provide seamless finish.

The internal surfaces of the walls and ceiling of Operation theatre should be sprayed with **anti-bacterial paint** (Factory Internal test report to be submitted) to a minimum dry film thickness of 300 microns with primer and putty. The anti bacterial paint coating should overlap the floor coving, ceiling system and door frames by 25 microns to provide a continuous sealed surface. The anti bacterial paint coating should be non-reflective type, highly resistant to abrasives, water, detergents and weak acids and alkali used in cleaning area. The coatings should have no loss of performance or adhesion to the substrate in the case of regular steam cleaning. Imported Anti bacterial paint applied should not leach out in order to maintain anti- microbial system throughout the life of the product.

A Galvanized steel cover plate shall be installed between the inner and outer wall panels, sealing and protecting the cavity from the ingress of vermin and contaminants, whilst allowing the removal at a later date for upgrading, disassembly, enlargement, or relocation.

Internal colour of the wall and ceiling panel shall be as suggested by the Institute.

2. PVC FLOORING (PVC ROLL)

1. It should be with 2mm antistatic seamless PVC flooring
2. Floor should be smooth, non-slip, impervious material conductive enough to dissipate static electricity but not conductive enough to endanger personnel from electric shock.
3. Electrostatic charge dissipation combat PVC seamless flooring of very high quality should be provided.
4. Thickness not less than 2 mm. Continuous roll should be used and joints should be welded by special PVC thermal welding units using PVC welding bars of same colour.
5. The sheets should be highly durable with resistance to shock and indentation. It should be scratch proof also. The conductive material should be uniformly impregnated as grains.
6. It should be inert to body fluids, chemicals and disinfectants. Should not be affected by temperature variation within the OT.
7. The floor should efficiently discharge electric charges up to 2 kV
8. Flooring should be done by skilled workers of accredited agencies authorized by the supplier of PVC sheets. The electrical resistance (point to ground) should be within 2.5×10^4 to 5×10^6 ohms. The floor should not allow build up of electrical charge beyond 100 volts due to antistatic effect. The corners should not be terminated sharply and concealed cove- former (aluminum) should be used to overlap the wall panel to a height of approx.25mm and sealed perfectly and uniformly. Self-levelling compounds should be used.
9. The conductive copper grid laid underneath the PVC sheet should be supported by liquid epoxy
10. compounds allowed to set as a uniform and level surface. The copper strips to be made visible by grinding and no copper strip should project more than 0.5mm above level surface to avoid damage to the PVC sheet. One earthing lead should be brought out from every 150sq.ft area and attaching it to the main earthing strip/ground.

11. Copper grounding strips (0.05 mm thick, 50 mm width) should be laid flat on the floor in the conductive adhesive and connected to copper strip of grounding. The connection from copper grid should be brought out uniformly at places to form equipotential grid.
12. Flooring should be mechanically shock proof, scratch proof, flame retardant and anti-microbial
13. Corners should be uniformly curved
14. Final surface should be non-corrosive to biological fluids and detergents.
15. Colour should be uniform pleasant and matching with ambience

3. LAMINAR AIR FLOW SYSTEM

1. The ceiling filtration system should be designed to ensure unidirectional distribution of sterile air of the surgical theatre to ensure the cleanliness of all the area covered by the air flow.
2. The Laminar flow system should comprise of thick extruded aluminum profiles frame and sealed gasket. The filters installed in the plenum should be suitable for application for laminar flow and clean rooms.

These filters should meet following specification -

Separators : continuous thermo plastic chord

Sealant : Polyurethane

Gasket : One piece polyurethane

MPPS average efficiency: > 99.95%

3 Micron DOP efficiency > 99.99%

Final Pressure drop : 600 pa (max)

Maximum Operating Temp: 60 degree Celsius

Maximum RH : 40-50 %

3. The ceiling system should be equipped with "H 14" class HEPA filters position in the ceiling to achieve 0.25m/sec flow at the diffuser.
4. Filtration Ceiling System holding structure, Filter frames and top plenum should be made of Aluminium/Stainless Steel.
5. The filtration ceiling system should have diffuser/flow equalizer to achieve uniform & constant air distribution over the whole surface.
6. The air management system should be designed to achieve class 100 with the following parameters:
Bacteriological class =B (5 CFU/m³) Particle decontamination kinetics CP =5 min ISO 14644/1 classification = ISO 5
7. The positive pressure should be maintained inside the OT to prevent contamination due to air from outside the OT.
8. The supplier should provide test certificate for HEPA filter and laminar air flow systems from the original manufactures.
9. Size of laminar airflow system minimum 8 feet X 8 feet or more.
10. Should be CE certified.

Note: Prospective bidders are advised to collect the information regarding CFM and AHU capacity from the respective institute site. Total flow rate of filter bank shall match the CFM of AHU.

EXHAUST AIR CABINETS

1. Return air exhaust grill should be provided in the OT.
2. The exhaust air cabinets should be openable and cleanable.
3. These cabinets should have suction from bottom and top also.
4. Designed flow rate should not be less than 1000 m³/hr. Distribution of exhaust air volume should be divided between fluff strainers to maintain the required pressure within the theatre without causing turbulence.
5. Return air exhaust cabinet should be made from SS304/Aluminum

Air Conditioning Duct inside the MOT

1. All the ducting inside the MOT shall be scope of the MOT bidder
2. All necessary HVAC interconnection for supply and return air shall be the scope of bidder (the institute will provide the duct upto outside of the MOT)
3. All the ducting should be as per industry standard and sheet should be Aluminum of appropriate thickness and insulated as per industry standard.

4. PERIPHERAL LIGHTING AND CLEAN ROOM LUMINARIES

1. To provide peripheral lighting and clean room luminaries with intensity min 500 Lux, it should be 8 in numbers for each OT. Should be with highly specular anodized aluminum reflectors and optical antiglare system.
2. Luminaries cover should be made of highly resistant, disinfectant proof laminated safety glass with stylish fine grained surface, glass pane with white coated steel frame.
3. The reflectors should be of high quality, cleanable and non-deteriorating.
4. The white luminaries body should be made of sheet steel/ perfectly powder coated, supplied ready for connection optionally for individual or series circuit with digital electronic control gear in multilamp technology.
5. Recess frames should be gas tight. The fitting should be flush with the ceiling and should be removable from top or bottom. The light fitting should be uniformly and aesthetically distributed on the ceiling to provide uniform illumination in the OT. Light should not interfere when green mode endoscopy is performed
6. Peripheral lighting should be done according to IP65 (international protection rating 65) / IP 54 regulations.
7. Control equipment for the general lighting and the light dimming should be provided in the theatre control panel

5. TOUCH SCREEN CONTROL PANEL- Imported

1. The control panel should be touch screen panel. This control panel should work as the central control panel for the HVAC controls, instruction board, light control, gas alarms, etc.
2. The touch screen should be wall mounted, stationed in the visibility line of the surgeon and OT staff. The access height should be convenient for the nurse to operate and help/assistant when in need.

3. The panel should accommodate digital clock and the elapsed time indicator.
4. The medical gas alarm should indicate high and low gas pressures for each gas service present in the OT including vacuum. This should be supported by audible alarm also. The panel should have an alarm mute(fault annunciation) facility. The sensors (pressure switches) should be at the nearest isolation valve.
5. Control for general lighting: ON/OFF and dimming controls organized in groups to provide uniform illumination.
6. Control of the operating light (major and satellite and camera control (on/off and intensity control) should be provided.
7. Hand free telephone set with memory should be located at one side.
8. Temperature and humidity control for the room connected to the AHU. (Adjustable from the panel) The controller should be capable of adjusting the temp adjustment of +/- 5 Deg with in 5Minutes wherever separate AHU is provided for each OT . "
9. Digital room pressure indicator in cm of H₂O or equivalent (signal from pressure sensor shall be provided to indicate pressure differential between OT and outside)
10. HEPA filter bank differential pressure indicator.

6. X RAY FILM VIEWER

1. LED type flat panel X-ray viewing panel should be supplied.
2. This should comply with relevant electrical safely codes.
3. This should be a 3 panel viewing screen.
4. Mounting should be flush with the wall to avoid dust accumulation and growth or organisms between wall and panel.
5. Body should be of extruded aluminum powder coated black with bacteria resistant and disinfectant resistant finish.
6. The diffuser on the front panel should be a uniformly lit screen.
7. Dimming electronic control should be enclosed at the bottom of the cabinet.
8. Proper spring loaded film clip with rollers should be provided to hold the films firmly and to remove the film without scratches.
9. Each panel should be able to illuminate films up to 14"x17" size. (Total 3 panels)

7 STORAGE UNIT

1. The storage unit should be made with minimum 1.50 mm thick stainless steel panels and should be with same finish of OT Walls. Air ventilation inside the Storage Unit should be suitably provided.
2. The storage unit should be divided 4 parts and each part should have individual glass doors with high quality locking system
3. The overall size should be approx 180 cm X 90 cm X 35 cm
4. Should be flush mounted/built-in to MOT with same finish.

8. HATCH BOX

A hatch should be provided in each operation theatre to remove waste materials from the operation theatre to dirty linen area/corridor just adjacent to Operation Theatre. Each hatch box should be equipped with two doors and the door should be operated electrically/motorized.

1. The hatch should be designed in such a way that only one door should be opened at one time.
2. The UV light should be so installed that it is kept on while both the doors are closed. This UV light has to be automatically turned off in case of opening of either of the doors.
3. Indicators should be provided on both sides of the OT so that door open / close status can be monitored from both sides.
4. Hatch Box material should be SS304
5. Size of the Hatch box minimum: 600mm x 600mm.

9. PRESSURE RELIEF DAMPERS

1. Pressure relief dampers or Over flow ports should be provided in each room to prevent contamination of air from clean and dirty areas.
2. Suitably sized air pressure relief damper should be strategically placed, enabling differential room pressure to be maintained and ensure that when doors are opened between clean and dirty areas.
3. Counter- weight balancing system should be provided in the PRD to maintain positive pressure inside the operation room.
4. Air pressure stabilizers should have unique capability of controlling differential pressure to close tolerance. The PRD should remain closed at pressure below the set pressure and should open fully at a pressure only fractionally above the threshold pressure.
5. The body should be epoxy powder coated as per standard BS colors. High grade electrolyzed steel plate should be used for body and high grade SS304 stainless steel for blades

10. HERMETICALLY SEALED SLIDING DOORS

1. The door should be a hermetically sealed, single sliding of following sizes
A - Door of 2.1 (H) X 1.5 m (W)
2. The controller should be capable of being operated by elbow switches/foot switches as well as touch less sensor.
3. The track should be of stainless steel/Aluminum and the running surface for the top rollers should be suitably angled to reduce resistance to movement
4. The door leaf should be hung by means of hard plastic rollers of high quality with double bearing at the top. Rollers should be provided under the stainless steel/Aluminium track to enable smooth and noiseless movement.
5. Opening and closing of the door should be microprocessor controlled electromechanical movement.
6. The door material should be of HPL Color should match the interior and care should be taken to make the leaf strong and light weight.
7. One should be able to open and close the door effortlessly in case of failure of automatic mechanism.
8. Door opening handle should be strong and sturdy. Material should be of SS (gloss finish). Should be provided with high quality cylindrical lock.
9. Door leaf should have high quality synthetic rubber gasket with long life to ensure hermetic sealing (to maintain air pressure differential). Air tightness 99.99% at a pressure of 100Pa.
10. The finished floor on either side of the door should be perfectly level (maximum permissible difference+1mm).
11. The overall thickness of the finished door should be 55 to 60mm. The inner part of the door should be filled with CFC free polyurethane foam thickness of 48mm or nearby. (Sealed airtight to prevent further ingress of any microbial organism).
12. The door and controls should comply with IEE regulation. All motors used should be DC brushless motors with essential isolation from mains.
13. Door should be with vision window 300 mm x 300 mm with double glazed panels and hermetically sealed.
14. Door movement should have minimum noise.
15. The starting time after receiving the signal should be adjustable between 0.5 to 20 seconds.
16. The door controller should be CE marked.
17. Test certificate for hermetically sealed door frame (factory test certificate) should be enclosed with the pre dispatch documents.

10B HERMETICALLY SEALED SLIDING DOORS

The door should be a hermetically sealed, single sliding of following sizes

A - Door of 2.1 (H) X 1.0 m (W)

Same as Sl. No.-10A

10C: VIEW WINDOW (WITH MOTORIZED BLINDS)

View window with motorized horizontal Venetian blinds sandwiched in two parallel toughened glasses of thickness 5 mm should be complete with FHP Motor Control for 90° rotation. The Window frame should be powder coated Aluminum of approved shape flush mounted to wall panelling material with proper sealing. The entire assembly should be completely sealed and fitted with proper Aluminum/SMS profile. The assembled thickness of the Window should be minimum 33 mm. The window blinds should be operated with Remote Control and manually.

11. OPERATING LIST BOARD

1. One operating list board should be provided in each operating theatre.
2. It should be made of ceramic having magnetic properties and should be flushed to the wall of the operating room.

12. SCRUB STATION

1. Compact surgical scrub sink should be designed for use in OT complex providing for pre procedural scrub up.(Double sink combination as suitable)
2. Each fixture should be fabricated from heavy gauge type 304 stainless steel (minimum thickness 1.5mm)and should be seamless welded construction, polished to a satin finish
3. The scrub sink should be provided with a front access panel which should be easily removed for access to the water controlled valve, waste connections, stoppers and strainers.
4. Hands free operation should include infra-red sensors with programmable adjustment.
5. Thermostatic mixing, valve control should be located behind the access panel and maintain constant water temperature.
6. Timing should be adjustable to meet individual application requirements.
7. Provided with infrared sensors, thermostatic control taps with fail safe temperature controls.
8. All units should have reduced anti- splash fronts.
9. Should have provision for soap/disinfection scrub solutions.
10. Knee/foot operated switch should be provided additionally.

13. ELECTRICAL INSTALLATIONS (Distribution Board, Isolation Transformer, Internal wiring, cable tray, etc.)

1. Distribution box, isolation transformer, leakage relays, cable tray, etc and all internal wiring, earthing inside the OT should be under the scope of MOT bidder.
2. Power distribution within the OT should be "provided" from distribution boards located local to each
3. theatre. Sub mains power to these panels should be by the general electrical contractor. From these
4. panels all distribution services within the departments should be run. Isolated power supply, insulation measuring and protection as per IEC standards should be provided. This unit should be EN/CE/UL/FDA/IEC certified
5. Institute will provide one point supply for three phase and/or single phase to the MOT vendor outside of MOT corridor/area.

6. DISTRIBUTION BOARD

- a) All high voltage equipment should be installed in a separate enclosure.
 - b) The remote cabinet should house the operating lamp transformers, mains failure relays, UPS, electrical distribution equipment & circuit protection equipment for all circuits within the operating theatre.
 - c) All internal wiring should terminate in connectors with screw & clamp spring.
 - d) Connections of the clip- on type mounted, on a CE approved rail & labeled with indelible proprietary labels.
 - e) Individual fuses or miniature circuit breakers should protect all internal circuits.
 - f) Complete schematic drawing with description should be enclosed with the equipment.
7. Earthed equipment bonding of all exposed metalwork should be provided.
 8. Power sockets within the Operating Theatres ancillary areas should be matched to the rest of the hospital.
 9. Light fittings within the clinical areas should be recessed LED type with control gear
 10. Fittings should be sealed In accordance with the standard IP54.
 11. All equipment should be fully and permanently labeled to identify and describe the function, operation and voltage of the apparatus concerned. Throughout and upon completion of the electrical installation, tests in accordance with relevant sections of the local wiring regulations should be carried out and the results recorded.
 12. All necessary interconnection of LAN cables, Telephone/intercom, copper strip, etc. to MOT from hospital source is the responsibility of the bidder.

14. OT LIGHT WITH CAMERA

A. OT Light – LED (Imported)

Operating Room Surgical Lighting System should provide an ideal combination of brightness, maneuverability, and shadow resolution without sacrificing color accuracy through a consistent LED technology.

Such Lighting System should have the following technical specifications:

1. Number of Light heads : Two per suspension
2. Colour Temperature range: 3800 k -5000 ($\pm 10\%$) - Variable colour temperature.
3. Field Size Diameter: 20 to 28cm (+/- 10%)
4. Depth of Field : 750 to 1100mm (+/- 10%)
5. Illumination Level : 160000Lux (Major Dome & Minor dome)
6. Controls : Control Panel (wall and on dome)
7. Rotation : 360 -330degrees
8. Sterilizable Handle: 02 Nos.
9. Mounting Type : Ceiling
10. Supply Voltage : 230 VAC 50 Hz
11. Bulb Type : LED
12. Dimming Range : 30% - 80%
13. Life of Light Source : >40,000 Hrs Surgical Light System Should be compliant with relevant European CE /US FDA standards

B. HD Camera System – 1080 p/i (Imported)

Integrated In-Light Camera System should be integrated at the centre of one of the domes of this lighting system/ third arm in order to capture images & video sequences of the open cases.

Such an autofocus – Locable camera should have the following specifications

1. Signal to Noise Ratio (S/N Ratio) : >50 dB
2. CCD : 1/3"
3. Optical Zoom : 10X

4. Digital Zoom : 12-15X
5. Video Output : HD, S-Video & Composite Video
6. White Balance & Gain : Automatic/Manual
7. Light and Integrated Camera should have a control through Touch Panel of the control
8. equipment placed inside the operating room

C. HD LED FLAT PANEL MEDICAL GRADE MONITOR (Imported)

Should be 30-32" High Definition Progressive Scan Flat-panel Medical Grade Monitors with ceiling mounted spring arm suspension to support high definition/HDTV progressive Scan images and should be able to support and display DVI/HDTV, RGBHV, S-Video, Composite video signals. Aspect ratio 16:9/16:10. Resolution – 1920X1080 or more The flat Panel suspension should be ready with the cables for integration of High Definition Digital(DVI/HDTV), RGBHV (High Resolution), SVHS (S-Video), Composite video signals to travel from the various sources of video like endoscopic camera, room camera, in light camera, high definition flat panel monitors, while assuring native resolution / signal.

15 RECORDING SYSTEM

Recording system to be offered separately. Recording system should be full HD monitor LCD 19" touch screen or more and having the one TB storage space. Data cable for communication from both pendants and monitors should be laid down upto outside of OT in a patch port for future expansion for all OT's.

16. PENDANTS FOR ANESTHETIST AND SURGEON (Imported)

A. Double arm moveable Pendant for Anesthetist

The Pendants should comply with NFPA 99C/HTM 02-01/ISO 7396-1/DIN. The support arms should be extremely robust and revolve on high quality bearings, so that the pendant head glides smoothly and quickly to any desired position

The Pendant should have the following specification:

1. Double moveable arms (any combination) with total coverage of 1800mm +/- 10% and 330 deg. Horizontal movements for each arm. Vertical movement should be motorized and the arm height should remain to a height greater than 6.5 feet above floor level
2. Weight carrying capacity of the arm should not be less than 180 Kgs. should have electromagnetic/pneumatic brakes
3. Each arm should be capable of 300-340 degrees of rotation, which can be easily adjusted to suit the desired mode of operation.
4. The Pendant Service Heads should be modular with minimum 800mm head. The heads should be capable of accepting a range of shelves, and infusion poles or other accessories. The Pendant Heads should support the range of Physiological Monitor Mounting Solutions.
5. The Pendant Service Heads should be supplied with medical gas terminal units and 5/15 or 6/16Amps dual Sockets.
6. Double arm pendant anesthetists : Each pendant should be supplied with pre-fitted outlets and probes as mentioned below –
 - Oxygen Outlets – 2 nos.,
 - Vacuum Outlets – 2 nos.,
 - Nitrous oxide – 1 nos.,
 - Air(4 bar) Outlets - 2 nos.,
 - AGSS outlet - 1 no
 - Electrical sockets - 10 nos.

Shelf with two rails one on each side – 3 no.

IV Fluid Pole with 4 hooks – 1No.

Data socket RJ-45/CAT6 -2 nos.

7. The pendants should be European CE or USFDA certified.

8. Pendant supplier should provide cut outs for Patch Panels in Integrated OTs. (only for integrated OT)

B. Double arm moveable Pendant for Surgeon

The Pendants should comply with NFPA 99C/HTM 02-01/ISO7396-1/DIN. The support arms should be extremely robust and revolve on high quality bearings, so that the pendant head glides smoothly and quickly to any desired position

The Pendant should have the following specification:

a. Double moveable arms (any combination) with total coverage of 1800mm +/- 10% and 330 deg. Horizontal movements for each arm. Vertical movement should be motorized and the arm height should remain to a height greater than 6.5 feet above floor level

b. Weight carrying capacity of the arm should not be less than 180 Kgs. Should have electromagnetic/pneumatic brakes

c. Each arm should be capable of 300 - 340 degrees of rotation, which can be easily adjusted to suit the desired mode of operation.

d. The Pendant Service Heads should be modular with minimum 800mm head. The heads should be capable of accepting a range of shelves, and infusion poles or other accessories.

The Pendant Heads should support the range of Physiological Monitor Mounting Solutions.

e. The Pendant Service Heads should be supplied with medical gas terminal units and 5/15 or 6/16 Amps dual Sockets. Each pendant should be supplied with pre-fitted outlets and probes as mentioned below –

Vacuum Outlets – 2nos,

Air (7bar) Outlet- 01nos,

CO2 Outlet - 01 nos.,

Electrical sockets - 10 Nos. (6/16A)

Expandable shelf (minimum width: 70cm & Depth min. 45cm) with two rails one on each side – 5nos. Data socket RJ-45 -2 no. IV Fluid Pole with 2 hooks – 1No. (Pole should be capable of stacking 4 nos of syringe pumps)

f. The pendants should be European CE or USFDA certified.

g. Pendant supplier should provide cut outs for Patch Panels in Integrated OTs (only for integrated OTs).

17. Medical Gas Pipe Line Interconnection (MGPS Lines to Pendants etc)

a) The bidder should ensure that all works carried out as per HTM 02-01 /NFPA 99C / DIN/ISO 7396-1 standard

b) Bidder should provide Oxygen, Air4, Air7, Co2, Vacuum, AGSS, and Nitrous Oxide, etc. supply to Operation Theatres from the existing lines terminated outside the MOT.

c) Bidder shall be responsible for supply, installation, testing and commissioning of complete MGPS system inside the operation theatre including Distribution piping, connection to Pendants, outlets and other essential accessories.

d) Copper pipes should be of solid drawn, seamless, deoxidized, non-arsenical, half hard, tempered and degreased copper pipe. All copper pipes should be degreased & delivered capped at both ends. The pipes should be accompanied with manufacturers test certificate for the physical properties & chemical composition. The copper pipe should comply with EN 13348

e) Copper pipe must have reputed third party inspection certificate (Eg. Lloyd's, TUV, SGS).

f) Fittings should be made of copper and suitable for a working Pressure of up to 17bar and especially made for brazed socket type connections.

- g) The copper fitting should comply with EN 1254-1
h) The Brazing filler material should comply with EN 1044

18. DIGITAL DISPLAY PANEL (WORK STATION)

The alphanumeric electronic Touch Screen should be a 29 inch wide screen monitor of latest generation model suitable to Indian condition should have Metal panel-LCD TFT, High resolution, maximum Optical clarity, USP Ports and compatibility to other hardware system. The touch screen should be for messages and data through displaying operating list and particular details etc., message storage and scroll display. Operating with Stylus. It should have a protective glass overcoat which protects the sensor by resisting scratches and increase durability. It should be mounted flush into the theatre wall with a sterile jointing system. NEMA sealable. The monitor should be completely water resistant with polyethylene gasket. Liquid on screen should not impede touch screen performance. The Digital viewing Unit (TFT) should be supplied and installed along with the Integrated CPU System. The TFT monitor should be with swivelling keyboard facility so that it can be integrated in to the hospital PACS, and HIS. The Integrated CPU should be of the following minimum configuration: Intel Core 2 duo Processor with 4MB L2- Cache, 2.66 GHz and 1333MHz FSB, Q35 Chip set; 4GB DDR2 Memory (Extention Possible) and flexible hard disk capacity minimum 500 GB; 2USB Access in the front side. Make-Stryker/DELL/Scape.

APPROVED MAKES

1	PVC Floor	Gerfloor/Tarkett/Forbo/Polyfloor/Armstrong/Altro
2	OT LED Light	Stryker/Maquet/Trilux/Berchtold/Simeon/Danmedics/Trumf/Martin/Evonos/Surgiris
3	Pendant	Ondal/ Pneumatic Berlin / Pneumatech Medical / Trilux/Stark Storm/Amico/Becon Medaes//Trumf/Martin/Drager/LM Medical /Maquet
4	Copper Pipe	Maxflow/Rajco/Precision
5	Door	Metaflex/ Dorma/Rebbon/Chem Pharm/SHD/GEZE
6	Sealed Window	Windowtech/Mac Decor/Vista
7	Surgeon Control panel	Bender/Trilux/ Pneumatic Berlin /Starkstorm/SHD/LM Medical/Rein Medical
8	Wall Panel(Stainless Steel)	TATA/Jindal/SAIL
10	Peripheral light	Philips/Wipro/GE/Crompton
11	Digital Display Monitor	DELL/Stryker/SCAPE/Rein Medical

RESPONSIBILITY OF BIDDER

Bidders are strongly advised to visit the site for assessment before the submission of tender offer

1. Third party quality certification of the imported Modular OT items from SGS/TUV/Lloyds/Bureau Veritas should be submitted by the contractor as “Certifies that the imported Modular OT items meet the technical specification and BOQ of the tender document vide contract No (Mention Contract No.)”

TECHNICAL SPECIFICATION OF ITEMS & EQUIPMENT OF PNEUMATIC TUBE SYSTEM(PTS)

MAIN CONTROLLER:

The entire system shall be electronically controlled by microprocessors and should be provided with software driven main control unit, which shall control the sending process and the compressor unit, supervise all system components. Main Controller shall be provided with required Coupler Hardware.

The sending process shall be indicated on display devices. The device also shall provide information to find the cause of a system malfunction. Customer-specific data such as the system's layout, target numbers, target names, arrival signals, priority and special functions must be selectable on site without change or external reprogramming of memory devices. A integrated uninterrupted power supply must provide the requested system back up time to paste all date before shutting down the system, so after power source is providing energy again a automatic system start shall occur and the system status shall get back in the operation mode as before. Chosen targets at stored containers must be kept in the memory to proceed them automatically after power failure restart.

All components of the pneumatic tube conveyor are constantly monitored; the operating software shall be based on action reaction control for any device. The status of each device shall be checked by the master control unit. A test program must be included to automatically check, move and supervise all of the system's devices, or specific selected devices, by access via service code from the Station control panel.

During both normal operation and testing, all devices inform the master control unit that the selected functional position should be reached. This shall ensure that this position truly should be reached. The system shall be designed in such a way that it shall not allow the unobserved pivoting of devices.

The system shall come with an efficient fault-clearance program that automatically recognizes operating errors, power failures, time-out errors and other system errors. It shall also allow the system to continue functioning; there is no need for the operating personnel to intervene.

It should be possible to redirect empty containers which will exceed the pre-allocated distance limit to a Station for maintenance to be carried out – new drivers to be fitted for example.

If required the main control unit should be able to control more than 1 container in the single line (Multiple container line) to increase the capacity of the system.

It should include the following:-

- Main Control Unit Hardware for "Power Control - All In One",
- Software package for Power Control - All In One extended includes the following:-
 - Serial Dongle,
 - Software for one Line,
 - Extension Software for Further Lines,
 - Editor Software for one client,
 - Software for Code-Tag System for 32 Devices, Extendable up to 3 Lines.
- Power Supply Unit,
- Power Supply Kit External,
- Additional Power Supply Unit with Kit External,
- Power Supply connecting cable for power supply.

FRONT LOAD PASS THROUGH STATIONS:

The Pneumatic Station should be designed as a fully automatic dispatch and receiving unit and used as pass- through station.

The Pneumatic Station should be able to send and receive containers. The conveying direction of the containers should be both sided (single tube reversing principle). Inserting a container into the Pneumatic Station and selecting a target number should be possible independent from system status.

The container should be loaded on the top side of the Pneumatic Station. The Pneumatic Station should be Steel made, maintenance free mechanism, with self-adjusting optical switches, with self-adjusting maintenance free gaskets for noise less operations, contact less censoring of the unit positions. There should not be any air exiting at the pneumatic station. With RFID readers for container ID and inventory, which should ensure automatic container redistribution to its home address & also non-acceptance of any items than authorized container. The Pneumatic Station should have Air cushioned soft landing facility for arriving container to protect samples. Provided with container rack and receiving basket with cushion.

END STATION

The Pneumatic Station should be designed as a fully automatic dispatch and receiving unit and used

as end station. The Pneumatic Station should be able to send and receive containers. Inserting a container into the Pneumatic Station and selecting a target number should be possible independent from system status. The Pneumatic Station should be controlled by the use of the integrated Touch Panel Display for the following features:

1. 7" touch screen display with multifunctional operation screens
2. Touch panel operation via finger, safety gloves or styluses
3. Individual programmable user profiles and customized hotkeys
4. Individual authorization levels for personalized users profiles
5. Touch screen surface protection for easy cleaning addressees are individually programmable; Search button and addressee index simplify the usage.
6. Bar Code Reader for Pharmacy Stations and Blood Bank Stations

The Pneumatic Station should be Steel made, maintenance free gear mechanism, with self-adjusting

optical switches, with self-adjusting maintenance free gaskets for noise less operations, contact less

sensing of the unit positions. There should not be any air exiting at the pneumatic station. With

RFID readers for carrier ID and inventory, which should ensure automatic carrier redistribution to its

home address & also non-acceptance of any items than authorized carrier. It should have Air cushioned soft landing facility for arriving carrier to protect samples. Provided with

carrier rack and receiving basket with cushion.

MULTI SEND & MULTI RECEIVE STATION

The Pneumatic Station should be able to send and receive containers from the same unit.

Inserting a container into the pneumatic station and selecting a target number should be possible

independent from system status. It should control the condition of the receiving station when sending to the selected receiving station is possible. It should be Microprocessor-controlled. The main Lab should be provided with Multi Receive and Multi Send Station to handle bulk loads. It

should be designed as a fully automatic dispatch and receiving unit and can only be used as end station. The Pneumatic Station should be Steel made, maintenance free gear mechanism, with

self adjusting

optical switches, with self adjusting maintenance free gaskets for noise less operations, contact less

sensing of the unit positions. With RFID readers for container ID and inventory, which should ensure automatic container redistribution to its home address & also non-acceptance of any

items

than authorized container. It should be built in a way that after a power failure it is self-examining and if necessary self-repairing. It should have Air cushioned soft landing facility for arriving containers to protect samples. It should be provided with container rack & PVC

Slide bend, sliced from the top for soft landing of the samples.

DIVERTER THREE WAY 160 MM:

The diverter must provide one incoming and three outgoing delivery tubes. The Diverter must provide a smooth connection between incoming and outgoing tube, to prevent impact on transported items. A maintenance free belt driven rotary oscillating pipe has to be pneumatically sealed to the device housing, to prevent air loss, self-adjusting Teflon gaskets have to provide airtight operation in vacuum and pressure operation. Approx.

SIDE CHANNEL BLOWER:

It should have separate Blowers of 3.0 kW, 3 phase 400v/50Hz, minimum 2800 rpm with minimum 200 mbar pressure, with low noise, unidirectional rotation with electronic air switch to switch between compressed air and vacuum.

Each blower should be provided with Frequency Converter (Variable Frequency Drive – VFD) for Control of slow speed for sensitive laboratory samples by frequency control of Compressor. The blower should be set go up to 75Hz with the help of Frequency Converter.

It should be provided with all the mounting accessories and soundproof enclosure.

TUBE (GREY) 160 MM:

Forwarding tube should include the cost of cable and other tube mounting accessories as are required for networking between Pneumatic Stations.

The forwarding tube should be made of PVC of 160 mm OD x 153.6 mm ID. Good Physical tensile strength, general medium density, absorption of water, combustibility self-extinguishing.

BENDS:

It should be of 90 deg. with radius not more than 800 mm (centre) with length approx. 1.5 mtrs, for optimal space utilization, grey color. The material should be made up of Polyvinylchloride PVC.

SLEEVES:

It should be made up of Polyvinylchloride PVC with length approx. 150 mm. The outer dia should be 168 mm & Inner Dia should be 160 mm.

CLUTCH CLAMPS:

The materials should be made up of high quality steel. It can be used at PVC, halogen-free PS/ABS and high quality steel tubes.

ADHESIVE GLUE:

It can be used for bonding thermoplastic pressure piping systems made of rigid PVC. The boiling point should be 66°C (150.8 °F) and Explosion limit should be lower 1.36% (V) and upper 12.6% (V). It should be easy bonding, even of larger dimensions and clean handling. It should be excellent gap bridging capability.

CLEANER:

It should be capability to remove loose and adhering dirt, oily and nicotine bedding impurities. The antistatic effect of the recently soiling should be prevented. It should be dries quickly and streak. The State of aggregation should be Liquid.

COMPOSITE SYSTEM CABLE:

It should not be localized and it should be from the principle equipment manufacturer with company brand name marked. It should be Polyflex- screened combination cable and combined with supply and signal wires. The wrapping should be double with polyester tape overlapped min 20%, thickness: 0.036 mm, minimum dielectric strength of 10kV.

SS CLAMPS:

The materials should be made up of SS of high quality steel. It can be used at PVC, halogen-free PS/ABS and high quality steel tubes.

INSERTS:

The Material should be made up of Foam PU and it can be used to transport various types of test tubes. It should be with suitable holders of vacationers and a pair shuttle bung for each carrier.

CARRIERS WITH RFID:

Carrier for hospital use should be with easy to operate swivel top mechanic, sealed load chamber, to prevent contamination of tubing in the unlikely event of spill of transported goods. This must be realized only by closing the sealed swivel top mechanism.

The "closed" position should be fastened in a lock-in position. The lid should be kept in this position by a spring force and has to be equipped with seals. Furthermore the design of the Carrier must be done in a way that an open Carrier can't be sent. Any carrier has to be equipped with two free programmable data transponder, system according to send receive device used by the manufacturer in the Pneumatic Stations send magazines. Transponders are used to electronically identify any Carrier by a unique address and to offer the user automatic redistribution to home Pneumatic Station and optionally a second address for dedicated locations or special container use. The carrier must provide an easily visible wear and tear resistant color coding system, which must be changeable also on site by the user without damage and not requiring special tools.

Inside-loading-dimension for Carrier Ø 160mm swivel top Ø115 x 400mm approx. Outer-dimension for Carrier Ø 160mm swivel top Ø150 x 420mm approx. Equipped with RFID Chips.

RFID

The system should be provided with RFID as a **standard solution**, this helps in proper management of Carriers with the help of return of empty carrier. It also does not allow anything else to go in the system, but the carrier. All stations should have RFID reader Cards for the carrier, duly installed in the dispatch magazine. All the carriers should have RFID programmable chips on both sides of the carrier (2 per carrier)

TUBING MATERIAL & OTHER ACCESSORIES

Screw Bolts 2 mtr Length
Cable Tie/Clip 300MM
Dowel - M10
Conduite for cable - PVC
Carrier Rack S.S.
Baskets S.S. for each station
Foam Cushion for Baskets
Eprouvette insert for carrier 160 PU foam
Inserts for auto unload station: Zip lock type

APPROVED MAKE: Swisslog/Aerocom/Sumetzburger / Telecom/Greenvac / Sitrtech

- **Third party quality certification of the PTS equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted by the contractor as “Certifies that the PTS equipment to be supplied/supplied for installation meet the technical specification and BOQ of the tender document vide contract No (Mention Contract No.)”**

**Development of IT Infrastructure (HMIS, PACS, QMS,
Network Infrastructure (LAN, WAN & Wi-Fi), LMS) for
Hospital & Medical College at Chandarpur,
Maharashtra**

Technical Specification

September - 2018



CONSULTANT

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Scope of Work

1. HMIS (Hospital Management and Information System) & PACS (Picture Archiving & Communication System): - Development, Customization, Integration, Installation, Testing, Implementation, Commissioning & Training with 3 years maintenance support.
2. Supply, Installation, Configuration, Testing and Commissioning of Server Hardware & System Software for HMIS, QMS, PACS, LMS etc. as per the requirement and scope of work mentioned with 3 years onsite OEM warranty.
3. Establishment of Wired & Wireless Network Infrastructure - Supply, Installation, Configuration, Testing and Commissioning of Local Area Network (LAN), Wide Area Network (WAN) & Wi-Fi (Indoor) Network as per the requirement and scope of work mentioned with 3 years onsite OEM warranty.
4. Queue Management System: - Supply, Customization, Installation, Integration, Testing, Implementation, Training & Commissioning as per the requirement and scope of work mentioned with 3 years onsite OEM warranty.
5. LMS (Library Management System) for Medical College- Development, Customization, Integration, Installation, Testing, Implementation, Commissioning & Training with 3 years maintenance support.
6. Supply, Installation, Testing & Commissioning of Computer Hardware & associated software with 3 years onsite OEM warranty.
7. Development, Customization, Integration, Installation, Testing, Implementation, Commissioning & Training of Web portals & Mobile Applications with 3 years maintenance support.
8. Three years maintenance support (labour & parts) shall be provided for complete IT Infrastructure (mentioned above).
9. Establishment of server room/Data Centre as per the requirement.
10. Any other work as per the requirement of the client.

Detailed Scope of Work

The Information Technology establishment of Medical College at Chandarpur would be done in following stages;

1. Requirements gathering
2. Customization
3. Integration
4. Implementation
5. Training

Broadly, the activities to be covered shall include:

- Project Initiation
- Development, Customization, Installation, Implementation, Integration and Maintenance of HMIS and Back office/ERP.
- Development, Customization, Installation, Testing, Integration, Implementation and Maintenance of integrated HMIS & PACS solution.
- Supply, Installation, Configuration, Testing and Commissioning of central hardware for application hosting.
- Establishment of Server room including Hardware, Software and other infrastructure as per the requirements.
- Supply, Installation, Configuration, Testing and Commissioning of Network Infrastructure (LAN/WAN and Wi-Fi) as per the requirements and scope of work mentioned.
- Training of the Hospital users for effectively use of the system.
- Documentation of the complete IT work for Medical College, Chandarpur.
- Provide on-going Maintenance and Support including software upgrades etc.
- Provide support and assistance for resolution of major Technical problems or Technical issues.
(Medical College, Chandarpur will deal with a single vendor, who shall be a System Integrator Technology firm (hereinafter referred to as — SI/Implementation Agency))
- **SI should ensure that proposed HMIS application including Back office/ERP application for Medical College, Chandarpur should be user friendly, interactive and easily understandable by the end users. The application should be used to make hospital paperless in all respect. These are parts of successful implementation of HMIS application and the mandatory part of this project.**
- **Minimum 15-20 Data Entry Operators should be provided as per requirement of site for successful implementation of HMIS, PACS and other applications during project implementation period. Scope of work includes master data collection, information retrieval etc.**
- **Minimum 5-8 Engineers or more or as per the requirement should be deputed at site during the implementation period.**
- **SI should provide the internet connectivity at site during the implementation period of the project. Adequate speed of the internet should be (minimum 50 mbps or higher bandwidth) available as per the requirements of the project.**

Deliverables of the Project

The Project Plan/main deliverables, as a result of implementation of HMIS at Medical College, Chandarpur, shall address:

- Project Management Plan
- Software Design and Development plan
- Implementation plan
- Pre-commissioning, Operational and User Acceptance Testing Plan
- Hardware requirement, Delivery and Installation Plan
- Network Design, Delivery and Installation Plan
- Training Plan
- Risk Management Plan
- Master Data Entry Plan
- Warranty Service Plan
- Task, Time, and Resource Schedules
- Post-Warranty Service Plan
- Technical Support Plan

I. The Medical College, Chandarpur will have the option to implement the various modules/products in a phased manner.(In 2 to 3 phases)

II. Documentation

It is the responsibility of SI to provide at least the following documents to client & HSCC:

- Gap Analysis Document (GAD) or System Requirement Specification (SRS)
- Software Design Documentation (SDD)
- User Manuals
- Training Manuals
- Implementation Manuals

III. Maintenance Support

- IT agency/SI shall be fully responsible for the entire IT project and integration of HMIS and PACS, its implementation on the LAN and provide 3 years maintenance support including upgrades of applications.
- IT agency/SI shall permanently post their engineers during the maintenance period at site who shall be responsible for onsite maintenance support (manpower and parts) of the complete IT Infrastructure i.e. Network infrastructure, Server Hardware, Computer Hardware and Software, all the applications including HMIS, PACS, QMS. This would also include addressing and fixing any technical snags reported by the end user.

- IT agency/SI shall be ready to make further customization / any changes as the need may arise from time to time during the above said period, without any extra financial cost.

For the maintenance support, following points shall be complied:

1. Day to day maintenance work for complete IT infrastructure
2. Maintenance support as per the standard practices and specification and manual of the equipment, complete in all respect and satisfaction of the client.
3. For Application software (HMIS & PACS) -
Up-gradation of the application and OS, new requirement of the user like new report preparation, new patches/bugs up-gradation etc. to be covered
4. Update of Antivirus software.
5. Regular Data backup and related activities.
6. Up-gradation of Licenses for all networking devices (Firewall, NMS, Wireless Access Points, Wireless Access Controller etc.).
7. Preventive maintenance of the hardware and software etc.
8. Maintenance of Hospital's website on regular basis as per the client's requirement.

Necessary manpower to be deployed for the above work.

Following is the minimum requirement of manpower for maintenance support:

Sr. no.	Manpower	Quantity
1	Application support/Operation support engineer with minimum 3 years of experience in relevant area. Minimum one application support/operation support engineer should be available 24x7 onsite.	1 No. The Application support engineers will maintain applications i.e. HMIS, PACS, QMS etc.
2	Hardware and Network engineer with 3 years' experience in relevant area. Minimum 1 no. Hardware and Network engineer should be available 24x7 onsite.	2 Nos. The hardware & network engineers will be responsible for maintaining the network infrastructure, computer hardware, servers etc.

In addition to the above manpower, additional manpower/expert shall also be deployed at site and also to provide offsite support as per the requirements of the Medical College,

Chandarpur. The number of manpower may be increased or decreased as per the requirement of client.

IV. Project and Technical Risk Management Plan and Procedures

IT agency/SI shall be responsible for assisting for Identifying and assessing potential technical risks of the project as well as identifying and managing actions to avoid, mitigate or manage those risks. SI is responsible for providing appropriate methods, tools and techniques for active identification and assessment of project technical risk; development of risk avoidance, mitigation or management strategies and monitoring; and reporting of risk status throughout the life of the project.

V. Time line

All IT work for the Medical College, Chandarpur shall be completed and 'Go Live' within 6-8 months' time from handing over site for IT works. Failing this, liquidated damages at a rate of 1/2 % of the contract amount (for IT work) per week of delay beyond the stipulated period, subject to a maximum of 5% of the total contract value (for IT work) for the delayed portion of the contract will be levied for delayed supply. IT agency/SI shall submit plan with detailed program for completion of all the activities of IT work along with manpower deployment schedule etc.

VI. Ownership of Data & Data Security

- a. The Medical College, Chandarpur shall be the custodian of the data.
- b. The SI shall ensure the provision of appropriate and adequate security levels, for protection of such data and other technology resources, which shall come into its custody during the implementation of the proposed solution.
- c. The infrastructure for the proposed solution, at each of the sites, shall be strictly and exclusively used by the SI for processing data related to the Medical College, Chandarpur only. Under no circumstances shall the infrastructure be used for any other purpose by the SI.
- d. The Medical College, Chandarpur / its authorized representative(s) shall conduct periodic / surprise security reviews and audits, to ensure the compliance by the SI to these control / access provisions.
- e. The SI shall develop and implement an "IT Security Policy" for the proposed IT solution. This IT Security Policy shall be in line with international guidelines and standards. The SI shall also keep itself updated with the latest IT Security Policy of the Government.

VII. Change Management:

- a. In the event a change is requested post customization & implementation of the proposed HMIS or any other application, the SI shall consider the change in scope along with the development / change implementation time estimate for the same.

System Integrator IT firm should provide integrated **Hospital Management & Information System** that meets the requirements specified in the Technical Requirements.

SI should ensure that proposed HMIS application including back office application should be user friendly, interactive and easily understandable by the end users. The application should be used to make hospital paperless in all respect. These are parts of successful implementation of HMIS application and the mandatory part of this project.

Upon completion of the project, the System Integrator IT firm shall provide a comprehensive report with details of the project. The hospital expects to receive from System Integrator IT firm the following outputs:

- a. A fully installed, well integrated, customized and functioning integrated Hospital Management and Information System that meets the need of hospital's requirements as specified in the scope of the services.
- b. A "live" demonstration to confirm and validate that the solution proposed by the System Integrator IT firm fully meets the requirements of the hospital.
- c. An executive summary report validating the implementation process and the various functionalities specified in the Technical Requirements.
- d. A proposal for the implementation of gaps that would have been identified by users both technical and functional.
- e. The System Integrator IT firm should specify the qualifications and experience of the domain specialists and experts in the implementation team, the software design team at the software development center.

Payment Terms

The standard payment terms shall be as below:

(a) Computer Hardware, Server Hardware & System Software for HMIS, PACS, QMS & LAN equipments

- (i) 60% on delivery of the equipments at site subject to submission of inspection report.
- (ii) 20% on installation and commissioning of the equipments.
- (iii) 10% on handing over to client
- (iv) 10% on successful completion of 3 years OEM warranty.

(b) Application Software Implementation (HMIS, PACS, LMS, QMS)

- (i) 20% after the preparation and acceptance by Client/HSCC of the detailed Design Document incorporating System Requirement Specifications and Detailed Design & development of entire Application Software and its loading into the system.
- (ii) 50% on implementation and acceptance of Application Software (User Acceptance Testing).
- (iii) 10% on completion of Training, Final Acceptance Test (FAT) and Go Live.

(iv) 10% after handing over of the system to client.

(v) 10% on successful completion of 3 years onsite maintenance warranty.

(c) Consumable

100% on supply of the item.

HMIS & PACS

1) HMIS (Hospital Management & Information System)

Functional Requirements

The functional requirements along with the services for the functional modules and sub modules are described in this section. The functional scope as described in the document may be increased based on departmental requirements.

All the modules and sub modules are expected to integrate and exchange information seamlessly.

Hospital Management and Information System

This section describes the functional requirements along with the services for the functional modules and sub modules:

1. Clinical

- 1.1. EHR, Doctor's Desk & Patient Portal
- 1.2. Nursing Management System
- 1.3. Order Management
- 1.4. OT management
- 1.5. Anesthesia Management System
- 1.6. Diet & Kitchen Module
- 1.7. ICU, HDU & CCU Management
- 1.8. Pharmacy Management

2. Administrative

- 2.1. Registration – Outpatient and Inpatient
- 2.2. Admission discharge and Transfer (ADT)

3. Diagnostic Investigations

- 3.1. Pathology (LMS)
- 3.2. Microbiology
- 3.3. Biochemistry, hematology and serology
- 3.4. Radiology information system (RIS)
- 3.5. Blood bank management system

4. Accounts and Billing

- 4.1. Patient billing

5. Services

- 5.1. CSSD
- 5.2. Laundry department
- 5.3. House Keeping
- 5.4. Ambulance/Vehicle Management
- 5.5. Miscellaneous Services
- 5.6. Medical Gas & Manifold System (MGMS)

6. Enterprise Resource Planning (ERP)/Back Office

- 6.1. Equipment Management System
- 6.2. Inventory Management
- 6.3. HR & Payroll Management

6.4. Finance & Accounting

6.5. Procurement

6.6. Record Room

7. Business Intelligence (BI) & MIS/Reports

7.1. MIS/Reports

7.2. Business Intelligence (BI) and Dashboards

8. Others

8.1. Maintenance Cell

8.2. Complaint Management/Grievances (Staff & Public)

8.3. Hospital's Website/Web Portal

1. Clinical

The clinical services take care of all system critical clinical information that has a patient context and ensures that proper care is delivered to the right patient at the right time by the right people.

1.1 Electronic Health Records (EHR), Doctor's Desk & Patient Portal

This module is an integrated patient viewer that provides a cross-disciplinary where a patient-focused view of clinical information resident in Clinical Data Repository is provided. This would constitute the view to the Electronic Health Record (EHR). The EHR will provide access to information in the form of result data, text documents, scanned documents, images and waveforms from interfaced foreign systems and medical devices, as well as integrated or foreign clinical systems. Foreign data, or pointers to data stored in external systems, will be resident in the EHR.

The information will be displayed within tabs and sub-tabs for different types of data groups like clinical summary, history, observations, etc.

The EHR will enable the doctors' access to all other applications relevant to their role through this application (Doctor's Desk). For example, doctors would be able to:

- View and update patient demographics
- Perform appointment scheduling of patients
- View appointment schedule lists
- Manage patient lists
- Manage problem lists
- Manage allergy information
- Manage care plans for a diagnosis and document the care outcomes
- Manage Orders from within the EMR Module
- Perform results review with ability to interface with LIS, RIS & PACS
- View patient bill including settled and outstanding values

In case of doctors on leave, information to be given to all concerned patients accordingly.

Doctor's desk shall be customised as per the requirements of the concerned doctors.

HMIS Solution should raise investigation at doctor's desk in various wards/OPDs.

The module will have the following capabilities:

- Ability to capture SOAP (Subject Objective Assessment & Plan)
- Ability to capture diagnosis with codes and status
- Ability to automatically generate and present treatment and discharge summaries
- Ability to capture outcomes
- Ability to make entries that are classified as being Critical Care Data (CCD) that may be visible to anyone – this information must be deemed to be critical for the survival of the patient and the lack of which may contribute directly towards fatal consequences for the patient
- Ability to generate, preview and print treatment summaries in OPD and discharge summaries in IPD/A&E settings

Prescription Management:

- Prescription based auto scheduling of medications
- Manual scheduling of medications
- Dosage details with instructions
- Set Alarm/reminders for medications
- Record medication “taken”
- Patient Education Content for prescribed medications
- Show Active and Past Medications
- Medication report - for period of time or for a medication

This module should cover at least the following features, but not limited to:

- Drug Data Base (DDB) & Drug Information Framework (DIF) based on pharmacopoeia covering Generics and Packaged Drugs.
- Integrated with Clinical Workflows
- Clinical Decision Support System (CDSS)
- Order Set Management
- Computerised Provider Order Entry (CPOE)
- e-Prescription Platform
- Electronic Medication Administration (eMAR) Module
- Clinical Documentation compliant to EHR Standards for OP, ER, Day care, IP, OT

HMIS application system should be complied with RxNorm standards and as per the rules & replications of Govt. of India.

Facility should be provided to rate patients by the doctors.

Patient Portal:

Appointment Request: The Patient Portal enables patients to submit appointment requests at their convenience. The portal also can be configured to direct the appointment requests to individuals or groups for follow-up.

Patient Appointment Reminders, Medication Refill Alerts, and Recall Notifications:

Patients can elect to receive these important communications from hospital through automated e-mails, text, and/or phone calls/SMS. Staff need not be involved, thus reducing workload and increasing efficiency, in addition to complying with Meaningful-Use requirements.

Visit and Discharge Summaries: The Patient Portal enables caregivers to automatically send secure electronic copies of critical reports like encounter notes and discharge summaries directly to their patients, and to organizations engaged in quality-reporting initiatives.

Lab & Radiology Results to Patients: Through the Portal, patients receive automated notices that their test results are ready to be viewed online.

Customizable Forms: With the Patient Portal, all of paper forms can be made electronically. Patients can fill the out the forms online before arriving at hospital, or on a tablet computer while waiting to see their doctor. The Portal automatically routes the forms to the appropriate individual or group for review and insertion into the EMR. Each electronic form is fully customizable.

Statements and Bill Pay: Once online accounts of patients are created, patients can request to have paper statements replaced with electronic statements. Patients can also make their payments electronically through the Portal.

Secure Messaging: Through the Portal, Patients and practice staff can exchange messages 24/7 securely and efficiently. it can be pre-determined who on staff receives the messages and how they get delivered based on the patient's identity and the type of message. This enables staff and physicians to respond to the patient queries when it best suits their schedules, which streamlines both front and back office workflows.

Personal Health Record: The Personal Health Record (PHR) embedded in the Patient Portal enables patients to both view and update their records in a timely manner. The PHR is constructed from patients' existing medical records. Law & rules shall be applicable as per India.

Patient Data Imports to EMR: With the Patient Portal, patients can fill out demographics, family histories, and practice forms online. Once reviewed and approved by hospital or staff, it automatically uploads the data directly into EMR. Law & rules shall be applicable as per India.

Facility should be provided to rate doctors by the patients.

Mobile/Tablet Applications:

HMIS, PACS & QMS applications should have their Mobile, Tablet or any other device based applications available on major operating system platforms which should be usable in user friendly manner for all types of users like patients, doctors & other hospital staff of the hospital. The mobile application should be customised as per the requirement without any extra charges. The customized applications should be made available to users without any extra cost. Grievance/Online complaint management should also be the part of this application.

Physician Portal

- Physician Login
- View Appointments for any time period
- View OT Schedules
- View Patient Demographic Data
- View Patient EHR
- Inbox for Communication

Patient Mobile Application for home/remote place monitoring:

- Patient Login
- View/ Update patient demographics
- View Summary EHR
- View alarm values/thresholds for each vital parameter
- Standing Orders and intervention plans as advised by the doctor based on the parameter values
- Patient should be able to ask for remote assistance or technical help while logged in from their account

A checklist should be made available to be used in case of referring patients to other hospitals.

1.2 Nursing Management System

The Nurse Management System assists the nurses in the care provided to patients throughout the hospital. The application will also maintain the basic personal data about nurses including their qualification, training and experience to facilitate resource scheduling and workload planning. The system will also provide for analysis of nursing load patterns.

The various services under the Nursing Management System module are given below:

Services

- Patient List
- Work-lists
- Nursing Information
- Medication Administration
- Patient Assessment & Classification
- Order Management for Store & Pharmacy

Nursing In-Patient Application

- Tablet based Application for Point of Care Capture & Review of data
- Demographic Details of patients
- Patient Allergies & Blood group
- Nursing Notes
- View Physician Notes (Admission Notes, Reassessment Notes, Progress Notes)
- View Diagnosis (Current, Active & Past)
- View Medications Orders (Current, Past & Home Medications)
- View IV Orders & Execute
- View Lab/ Radiology/ Procedures & Other Orders & Execute
- Lab/ Radiology Results
- Vitals
- Intake/ Output

Nursing Out-Patient Activities

- Tablet based Application
- View Appointments based on status for selected period of time (All, Arrived, Consulting, Seen)
- Appointment status graphical view

- View EHR data of Patient (Summary & Encounter wise view)
- Capture Patient Complaints, Allergies, Home Medications, Family History, Lifestyle & Social history
- Capture Vitals through relevant medical equipments.

Patient tracking facility should be made available at nursing desk and reception counters in hospital.

Nurses & doctors should be provided with the Inpatient & Outpatient applications to manage their workflows over smart phones, tablets etc.

1.3 Order Management

The Order Management application addresses order entries, order review and/or validation, inter-departmental communication, order inquiry, and reporting of order entries of the hospital. Any authorised user in the hospital will be able to place treatment orders. Similarly, authorised users will be able to view current order status and results.

The various services under the Order Management module are given below:

Services

- Manage Order Entry
- Medication Orders
- Order Tracking
- Results Reporting
- Charging

1.4 OT Management

The Operation Theatre will be managed as an isolated operational area that has its own scheduling, resource allocation, raising of appropriate alerts (non-availability of appointment slot, resource), ability to enter procedure notes, manage inventory control both for the area as well as during procedures (instruments and gauze counts), etc. System should provide an interface & link with other departments particularly Laboratory, X-Ray, Pharmacy, Wards, Blood Bank etc. as per the requirement. Alerts should be generated to make sure that OT order sets/work lists are completed.

The various services under the OT Management module are given below:

- OT Scheduling
- Procedure Order sets
- Documentation
- Video recording and archiving
- Standard surgery-wise list of checkpoints & alerts as per the needs.

OT Video Recording

Recording of surgical procedures is very important education tool for medical students/ fraternity. The unique medical cases should be recorded via audio/ video medium and stored in system and reproduced to whoever seeks them via proper privileged based rights. Videos of the surgeries should be live streamed in real time without any time lag in any place outside the OT either using the LAN or the internet connection. High bandwidth fibre cable laying

should be done as per the requirement. Facility for audio video conference should also be provided.

Display information about Operation Theatre

This system will provide an accurate and minute to minute update on the number of patients inside the OT (that is in each theatre) as well as the progress of surgery for the individual patient. All the relevant information shall be publicly displayed online in a real time manner on the LED TV.

1.5 Anesthesia Management System

The anaesthesia management system will take care of all the anaesthesia related activities including Pre-Anaesthetic Check-up, Pre-Induction, Induction, Post-Induction and Recovery Stages along with post-surgery order management.

The various services under the Anaesthesia Management System module are given below:

Services

- Pre-Anesthetic Check-up
- Pre-operation Management
- Post-operation Management
- Data from Anesthesia machine

1.6 Diet & Kitchen Module

This module will assist the hospital kitchen in providing meals to inpatients as per the instructions of the dietician. The module facilitates the dietician to prescribe a diet as instructed by the physician to any given patient. The module also allows the maintenance of meal scheduling, customizing meals as per patient needs and recording of individual meal orders. System should generate alerts to the users/hospital staffs/nurses for the diets to be provided to patients by sms & email as per the requirement. The inventories & consumables in the kitchen, their indent generation, etc. will also be managed through this module.

1.7 ICU, HDU & CCU Management

Modules for ICU, CCU, HDU etc. should be customized & developed as per the requirement of the hospital.

1.8 Pharmacy Management

The Pharmacy Management System will take care of all drugs-related and other disposable items that have a definite expiry date.

The system will maintain balances and a transaction history for each medication item including cost and suppliers.

Movements will be input manually and automatically from the sales/purchase order processing systems and transfer requests would automatically update stock balances. Stock would be valued on any of the following basis FIFO, weighted average and LIFO when a

stock line is created the standard cost will be input. An issue note would optionally be printed for all issues. There would be no restriction on the number of stores held on the system. There would be no restriction on the number of bin locations held on the system.

Summarized monthly stock movements would be retained on the system for 5 years and be available for enquiries.

The system would interface with the purchase order processing system so as to produce purchase order recommendations.

A list of available and authorised medications with their suppliers will be maintained.

A list of suppliers/rate contractors will be maintained.

The various services under the Pharmacy Management System module are given below:

Services

- Demand
- Management/Indenting
- Drug Dispensing
- Drug Receipts
- Process Monitoring
- Stock Management
- Interfacing

Drug dispensing unit should be provided by SI.

The pharmacy management module needs to be linked with Drug Warehouse & any of its application. All the requirements and customization shall be done as per the requirement of client.

Pharmacy Management System

1. Pharmacy Management services take care of all system critical information that ensures that all medication required for properly treating a patient are adequately stocked and maintained. It is important that all drugs, items and articles are constantly at the disposal of the care providers. All pharmacy stores and sub stores shall be part of this module
2. System shall have facility to create main stores and sub stores in each facility with integration of all the stores
3. Following are the designated sub-stores, but not limited to:
 - a. OPD Pharmacy
 - b. Emergency Department
 - c. Injection and Immunization Room
 - d. OT
 - e. Wards
4. System shall maintain a master list of suppliers with unit cost of each item

5. System to facilitate creation of standard and unique codes for department and locations
6. The system should allow the Store In-Charge to upload the scanned copies of required document like bills, invoices, etc. and fills other details in the system
7. The system should have the ability to maintain Location master data.
8. Standard list of the drugs and medical supplies used in the store should be maintained
9. Capturing unique Item Description and code in the Inventory Master File
10. Capturing associated Unit of Measurement in the Inventory Master File
11. Capturing Lead Times in the Inventory Master File
12. Facility to define Item Codes under an item group.
13. Facility to generate Store ledger with the following details for each item:
 - a. Opening balance (Quantity and value)
 - b. Receipts and issues
 - c. Closing balance (Quantity and value)
14. Should be able to enter supplies needed patient -wise by entering/ selecting: Name of item, Quantity.
15. The system should be able check the availability and quantity of items / drugs / articles / tools etc. at all sub-stores and main store
16. Stock would be classified and maintained on any and all of the following categories like sub store wise, VED, ABC, Expiry date of medicine, disease wise, FSN and high risk medication, High Cost.
17. The system will facilitate retrieving details of available drugs (batch number, expiry date, location) in the pharmacy / drug store & reserve drugs for the indent based on the item code and quantity mentioned in the approved indent
18. A list of available and authorized medications with their source (warehouse or local purchase) will be maintained and auto updated from existing software
19. Monitoring and Tracking of Supplies to Hospital units, Management of materials, Management of suppliers/drugs/items/equipments
20. To provide alerts to the officials concerned for tracking their use in order to enable effective monitoring and avoid any pilferages
21. The system will support planning methodologies; re-order point, safety point, lot sizing, lead times, min/max levels etc.
22. Shall have facility to transfer and record material from one location store to another
23. Medicines/articles that are consumed as per prescription/generated and daily expense

register (prescription wise consumption) should be generated by the system as per information entered by respective Users

24. The items which are damaged should also be entered into the system to adjust the stock of that only after proper approvals on the system by the authorized person

25. The system should provide facility so that outgoing medicines and prescriptions will be automatically deducted from its stock list

26. The system should provide facility so that ; For each item-store combination, the minimum, maximum and re-order quantities will be maintained depending on the policies and procedures adopted for replenishment of stock at the sub-stores

27. To provide alerts to the officials concerned for tracking their use in order to enable effective monitoring and avoid any pilferages

28. The system should maintain data for any Recall of Drug due to any reaction reported, and track the entire batch of medicines

29. The system will generate a list of near-expiry items that are due to expire 30 days or as defined from the date and display as an alert to the user

30. The system should keep an account of all the drugs which are near expiry or have expired so that period they may be returned back to the Central Drug Store to be returned back to the vendor

31. Demand, Indenting, receipt of Stores

a. Each of the stores should have the capacity of raising an indent based on demand forecast/previous consumption at fixed time interval through the store module as well as auto indent based on minimum reorder levels and availability in main store

b. The system should have provision to track auto indents as well as online requests from various departments like OPD, IPD, Emergency, Labor room, OT, Pharmacy, etc. The system should track all requests through a separate unique store ID.

c. The demand generated should be automatically consolidated by the system for the Store In-charge.

d. The system should be able to shortlist the items to be purchased at hospital level and items to be indented from warehouse.

e. Should be able to print the indent sheets according to prescribed format.

f. The system should provide facility so that allowing tracking of the indent throughout the creation and approval cycle using the unique indent number.

g. The system will have the ability to display the alert for the indent approving authority on receipt of indent approval requests in the system.

- h. The system will have the ability to capture the approval of the Indents & transmit the approved indent details to the stores.
- i. If the medicine is not available with the approving authority the system would generate Non Availability Certificate automatically to initiate local purchase.
- j. According to approved indent a dispatch note will be generated in a prescribed format and will be sent by the system to indenting authority.
- k. Once the supplies are received, digital stock register is updated automatically. The system should maintain a re-defined checklist for the inspection of stock and capture the status of the inspection for each aspect / items.
- l. A barcode should be generated through the system and attached to the stock for further identification and tracking within the hospital stores. In case the bar code is already there the system should have the provision to read the bar code.
- m. The system will have the ability to record the details of drugs received against the approved indent including the following: Date of Receipt, Drug Name, Drug Quantities, Batch Number, Expiry Date.
- n. The system will have the ability to validate the receipt against the Indent & Dispatch note
- o. The system will have the ability to generate Receipt Report in which item details like quantity demanded, Expiry date, Batch number, quantity received, quantity accepted, quantity rejected etc are included
- p. The system should allow entry of drugs procured locally and maintain complete inventory of list of items/articles

32. Reports & Analysis

- a. Generate inventory reports as per requirement of user
- b. Store wise periodic analysis and demand projection
- c. Inquiry & Reporting for Inventory Status (by item-code, type, etc.)
- d. List of Indent with status
- e. List of materials vendor-wise
- f. List of vendors with unit cost of item
- g. Location-wise, specialty-wise, disease-wise and month-wise consumption reporting
- h. Comparative analysis of location-wise inventory
- i. The system will have the ability to maintain detailed audit trails for the transactions carried out in the system for issuing the drugs including date & time and details of user

conducting the transaction in the system

j. Inquiry & Reporting for Slow Moving and Obsolete Inventory.

Maintains all records of the stock in store/warehouse.

- Delivery of medicines to the patients at their residences.
- Records of issue & consumption of drugs /medicines on daily/weekly/monthly/yearly basis.
- Records of all the generic as well as branded medicines, their alternatives & their rates.
- Alerts for the expiry of medicines or almost expiring drugs.
- Automatic dispensing of medicines (e-prescription/others).

2 Administration Services

Administrative Services: The administration services take care of all system critical non-clinical information that has a patient context and ensures that proper and timely care is provided to the patients.

2.1 Registration (Online & Walk-in patients)

1. The system should allow for registration/appointment online (HIS Web Portal as well as patient's mobile app).
2. The system should allow the Registration desk operator to enter following demographic details of the Patient, but not limited to:
 - a. Name
 - b. Age
 - c. Sex
 - d. Address
 - e. Mobile / contact number
 - f. Government issued ID proof
3. The system should generate a Unique Patient ID upon successful registration, valid for seeking any healthcare services across health care institution. The final format should be discussed and agreed with HSCC/Client.
4. For walk –in patients the system should capture the required demographic details provided by the patient/ relative.
5. The system should allow search of the registration record using the “search component” for existing and new patient registration.
6. The Unique ID issued to the patient shall have lifetime validity.

7. The system should indicate if the Patient is liable to pay any fees for availing any healthcare services, based on defined criteria for exemption.
8. The system should display the available registration details / Patient registration information already existing in the database when any of the above parameters matches, during the registration process.
9. The system should allow the operator to collect applicable fees, as defined in the “Payment” component.
10. The system should also allow the Registration desk operator to select the relevant OPD doctor and specialty/OPD Room as per the defined roster available for the day. The system should assist the operator in suggesting an equal distribution of the Patient queue for all doctors in the same OPD.
11. The system should allow configuration of maximum number of patients to be assigned to a particular OPD doctor in a particular shift.
12. The system should have the feature for Electronic Queue Management System and over ride facility.
13. The system should automatically generate the “Token” number specific to the concerned OPD. This token number should be tracked throughout different departments / sections of the Hospital. The display systems installed within the Hospital premises should display the Token number and the sequence for all Patients to see.
14. The system should be able to print the registration receipt on a sticker which can be attached to the pre-printed OPD card. The registration receipt is proposed to have the following information, but not limited to:
 - a. Bar Code (generated as per Unique ID)
 - b. Unique ID
 - c. Payment Information {in case of exempted patients, the payment mentioned will be Zero (0)}
 - d. Date and Time Stamp
 - e. Token Number
 - f. Any other relevant information, as applicable
15. In case of “Emergency Registration” the system should generate bar-coded wrist tags with unique ID, which can be attached to the Patient, based on defined categories.
16. The system should scan the barcode and link the demographic as well as preliminary treatment details to the Patient ID. Rest of the search and registration features along with registration process should remain as described above.

For patient registration, sufficient nos. of face detection cameras should be installed & it should be integrated with HMIS so that patient's image is linked with patient's data within 3-5 seconds. The face recognition feature of the cameras should be capable of detecting double capturing/redundancy to avoid duplicity of images. All the hardware, software required for installation of cameras should be provided by SI without any additional cost. No extra charges will be paid to SI.

Appointment Scheduling: There needs to be an efficient, user friendly appointments system to enable new and follow-up appointments to be made rapidly for consultations and receiving services like investigations etc. Additionally, there is a requirement to allow for any other hospital-wide resource scheduling to be carried out, like, appointments for use of equipment or certain rooms or Operating Theatres etc. The system will allow appointment scheduling to be performed at any point of care within the hospital apart from reception.

All appointment related activities such as new appointments, cancellations, re-scheduling, wait-lists, etc. must be possible.

The various services under the Appointment Scheduling module are given below:

Services

- Appointments Management
- Patient Tracking
- Doctor details
- Patient list at doctors

Patient should be able to make online appointments from hospitals website or any other authorised & approved portal or patient's mobile/tablet application and should be integrated with HMIS & QMS. The online appointment should not take more than a few seconds to be completed. The form for making online appointment should be user friendly and easy to use.

Smart Card System

Patient should be able to receive a health card which should have record of their demographic data including his/her passport size photograph & electronic medical record to some extent. It should be linked with the HMIS. The card should also enable to make payments through it.

2.2 Patient Admission, Discharge and Transfer (ADT)

The patient administration module handles all functions like registrations, admissions, discharges, transfers and patient appointment scheduling for visits, admissions and investigations etc. It permits a comprehensive registration for most patients while allowing quick registration for rapid attention in the accidents & emergency (A&E) department. The system is additionally able to handle bed management of all beds within the hospital thereby enabling the reception clerks to locate available beds within a department or location and assign beds during admission process at the registration counter itself. Although bill payments can also be accepted simultaneously, the Billing functionality is explained in the Patient Billing sub-module.

The various services under the Patient Administration module are given below:

Services

- Registration
- Admission
- Discharge
- Transfer
- Pre-admissions & Waitlists
- Bed Management
- Bed charges
- Separate identification & marking of MLC cases.

3 Diagnostic Investigation Services

Investigation Services: The investigation services take care of all system critical information related to investigations that has a patient context. It ensures that proper care is delivered to the right patient by the right people after proper evaluation and assessment of the patient's condition that can only be ascertained through investigations carried out in specialized laboratories and units and reporting them to the care provider to as high degree of accuracy as is possible under the current circumstances.

3.1 Pathology

The Pathology module of the Laboratory Information System module is to be used in the Pathology Department, serving the needs of the Inpatients, Outpatients, Emergency Departments and Operation Theatres.

All observations will use LOINC (Logical Observations Identifier Names and Codes) codes wherever applicable. All diagnosis will be coded using ICD10, when the former is not found to be satisfactorily able to address the correct diagnosis.

The various services under the Pathology Information System module are given below:

Services

- Ordering
- Collection Lists
- Specimen Registration
- Work lists
- Results Entry
- Results Verification
- Results Reporting
- Charging

3.2 Microbiology

The Microbiology module will be used in the Microbiology Department, serving the needs of the Inpatients, Outpatients, and A&E Departments.

All observations will use LOINC codes wherever applicable. All diagnosis will be coded using ICD10, when the former is not found to be satisfactorily able to address the correct diagnosis.

The various services under the Microbiology Information System module are given below:

Services

- Ordering
- Collection Lists
- Specimen Registration
- Work lists
- Results Entry
- Results Verification
- Results Reporting
- Charging

3.3 Micro Biology, Biochemistry, Hematology & Serology

The Biochemistry and Serology module will be used in the Biochemistry and Serology Department, serving the needs of the Inpatients, Outpatients, and A&E Departments.

All observations will use LOINC codes wherever applicable. All diagnosis will be coded using ICD10 when the former is not found to be satisfactorily able to address the correct diagnosis.

The various services under the Biochemistry Information System module are given below:

Services

- Ordering
- Collection Lists
- Specimen Registration
- Work lists
- Results Entry
- Results Verification
- Results Reporting
- Charging
- Quality Control

LIMS (Laboratory Information & Management System) system.

- Study of existing system and GAP analysis.
 - Implementation in Medical College, Chandarpur.
 - Interfacing with all Medical Equipment.
 - Interfacing with HMIS & PACS.
 - Data will be stored centrally as well as locally.
 - Training to all users/stack holders.
 - Assessment of Hardware requirement
 - Network Infrastructure
 - Servers & Storage, Workstations etc.
 - Interfacing cables, Hardware and software, API etc.
 - MIS/Dashboard – Availability of details centrally and Hospital wise.
1. The system should have provision to track requests from various departments like OPD,

- IPD, Emergency, OT etc. The system should also have provision to track samples from outside Hospital as well, sent for testing. The system should track all internal and external test requests through a separate unique test ID.
2. The system should have defined list of Lab tests under various categories, available for selections by the concerned operator / Nurse / doctor, through user friendly select options.
 3. The system should generate the invoice automatically after selection of the required tests prescribed for a Patient. The invoice / receipt should contain the following information, but not limited to:
 - a. Bar Code (generated as per Unique Patient ID)
 - b. Test ID
 - c. Payment Information {in case of exempted patients, the payment value will be null
 - d. Date and Time Stamp
 - e. Token Number
 - f. Any other relevant information, as applicable
 4. The system should have personalized dashboard with queue management of all the requests made through the system, including provision to define priority.
 5. The system should have separate processes / workflow defined for test labs. The system generated Token Number will be provided to the Patient for providing the samples at sample collection counter, after required payment is done, if any. Also the doctors will have the facility to define the Emergency requests, which will be given priority in sequence.
 6. The display systems installed within the Hospital premises should display the Token number and the sequence for all Patients to see. On selections of the Patient record / Lab request by the Lab in-charge / technician, the system should display his / her token number on the display unit, and at least next 2 in sequence.
 7. The system should generate unique sample IDs, which can be attached to the sample containers / tubes.
 8. The system should have the provision to scan the Patient unique ID bar code and the Sample ID bar codes, and link it with the Test ID generated for the Patient.
 9. The system should track the status of the samples sent to Lab from sample collection counter.
 10. The system should match the number of sample IDs generated and numbers of samples

collected, and send intimations accordingly to the Phlebotomy counter operator and Lab in-charge.

11. The system should allow Lab technician to accept the samples sent for testing. The system should have provision to highlight the discrepancy if any.
12. The system should capture the test results directly from the testing equipments, if the facility is available, or provide an option for the Lab technician to enter the test results in a pre-defined format. The system should provide a mechanism of forwarding the test results to the laboratory doctor to authenticate each and every test result, before it to become the final result and before it can be printed or distributed online.
13. In case of OPD Patients, the system should generate an SMS and email alerts to Patients mobile number as soon the Lab test reports are submitted and ready for printing. In case of IPD, Emergency, OT, etc. the system should have provision to display the test results on the respective dashboards of the doctors / specialists, and send required intimations to the concerned staff.
14. The system should track the dispatch status of Lab test reports from the “Report Dispatch Counter”, when the Patient / relative collect the required reports.
15. The system should have provision to track the “Panic” values. As soon as the test results are finalised, the system should automatically determine if the test results are within a specified pre-defined range. The system should send alerts to the concerned Hospital staff / Nurse / Doctor, and display the test results on their respective dashboards in all such cases. This provision should be available for all cases.
16. In out-patient cases, it is proposed that the follow-up calls from the Help desk may request the Patients to visit the OPD, if the test results depict “Panic” values or for collection of reports.
17. The system should have laboratory inter linkages with store for inventory and stock management of the reagents used for various tests and should have provision for auto indenting, if the supplied goes below a specified level.
18. There should be provision for raising e-indent for bulk requirements of reagents by the concerned Lab technician.

3.4 Radio-Diagnostic Information System

The Radiology system will cater to all the requirements of the Radiology Department: it provides for scheduling of appointments for examinations, examination registration, results reporting, entry of post examination information, and film tracking.

The system would interface to the Pharmacy Management and Inventory Control applications to update the consumption details directly.

The system should provide facility so that this module will interface with the Picture Archiving & Communications Systems (PACS).

The system will be able to seamlessly handle inbound and outbound HL7 messages from any system that has similar capabilities.

The system will be DICOM 3.0 or higher compliant (compliant to the latest DICOM).

The system should provide facility so that the application is to be web-enabled.

The various services under the Radio-Diagnostic Information System module are given below:

Services

- Radio-diagnostic Setup
- Appointments
- Investigations
- Results Reporting
- Post-investigation
- Management
- Film Tracking
- Charging
- Queries & Reports

Radiology Information System (RIS):

1. The system should have provision to track requests from various departments like OPD, IPD, Emergency, OT, etc. The system should also have provision to track investigation requests from outside Hospital as well. The system should track all internal and external test requests through a separate unique Radiology ID.
2. The system should have defined list of Radiology tests under various categories, available for selections by the concerned operator / Nurse / doctor, through user friendly select options.
3. The system should generate the invoice automatically after selection of the required tests prescribed for a Patient. The invoice / receipt should contain the following information, but not limited to:
 - a. Bar Code (generated as per Unique Patient ID)
 - b. Test ID
 - c. Payment Information {in case of exempted patients, the payment value will be null
 - d. Date and Time Stamp
 - e. Token Number

- f. Any other relevant information, as applicable
4. The system should have personalized dashboard with queue management of all the requests made through the system, including provision to define priority.
 5. The system should allow respective Doctors advising Radiology investigations / Nurse / operator, to see the vacancy / sequence at Radiology Department and opt for a specific schedule, as required.
 6. The system generated Token Number will be provided to the Patient undergoing Radiology tests, after required payment is done. Also the doctors will have the facility to define the Emergency requests, which will be given priority in sequence.
 7. The display systems installed within the Hospital premises should display the Token number and the sequence for all Patients to see. On selections of the Patient record / Radiology request by the Radiology technician, the system should display his / her token number on the display unit, and at least next 2 in sequence.
 8. The system should have the provision to scan the Patient unique ID bar code and the Test IDs bar codes, and link them with the Patient digital record.
 9. The system should track the status of the Radiology tests requested and Radiology tests conducted for each Patient.
 10. The system should match the number of Radiology tests requested and number of Radiology tests conducted, and send intimations accordingly to the concerned administrators and Radiology in-charge / technician.
 11. The system should allow Radiology technician to accept the Patient sent for Radiology testing. The system should have provision to highlight the discrepancy in radiology test conducted and permit a re-do.
 12. The system should capture the test results directly from the Radiology equipments, if the facility is available and provide an option for the Radiologist to enter the investigation results / summary in a pre-defined format, with user friendly select features to the extent possible.
 13. In case of OPD Patients, the system should have a provision to display the finalised reports and generate an SMS alerts to Patients mobile number as soon the Radiology test reports are submitted and ready for dispatch. In case of IPD, Emergency, OT, etc. the system should have provision to display the finalised reports on the respective dashboards of the doctors / specialists, and send required intimations to the concerned staff.
 14. The system should have the provision to track panic results as soon as the report is finalised the system should send alerts to the concerned staff/ nurse/ doctor and display the test results on their respective dash boards in all such cases.

15. The system should track the dispatch status of Radiology test reports from the “Report Dispatch Counter”, when the Patient / relative collect the required reports /films.
16. In out-patient cases, it is proposed that the follow-up calls from the Help desk may request the Patients to visit the OPD, if the test results depict “Panic” values or collection of reports. This feature may be implemented at later phases of the project implementation.
17. The system should have Radiology inter linkages with store for inventory and stock management used for various tests and should have provision for alerts, if the supplied goes below a specified level. There should be provision for raising e-indent for bulk requirements of films / articles by the concerned Radiology technician.
18. The system should have integration capability for Picture Archiving & Communication Systems (PACS), for Medical College, Chandarpur
19. The system will be able to seamlessly handle inbound and outbound HL7 messages from any system that has similar capabilities
20. The system should be DICOM 3.0 compliant
21. The system should provide facility so that the application will be web-enabled.
22. The system should also allow for setting up a policy for automatic transfer and deletion of digital images from PACS
23. The application should have streaming technology for facilitating faster viewing of the images over the net (for PACS).

3.5 Blood Bank Management System

The Blood Bank Management System module will cater for the management of all donor records, bloodstock, laboratory, inventory and patient-related operations for Blood Bank.

The system would interface with the Inventory Control, Patient Billing, Order Management, and Nursing Information System applications to update the consumption details directly.

The various services under the Blood Bank Management System module are given below:

Services

- Donor Management
- Blood Stock Management
- Laboratory Operations
- Charging
- Local Inventory Management

Electronic Blood Request

This is an electronic system through which requisition for blood will become a simpler and easier process as only one form needs to be filled electronically. Demographic details of patients will be automatically updated by just entering the Patient Registration No. Lab details and the components requirement will then be sent to the blood bank. All the requisitions made from any patient till date will be easily obtained through this system.

Blood Bank Management System Module

1. The system should display all the relevant information related to blood donation as well as requisitions / availability through various channels like Web Portal, Help Desk, Display units etc.
2. Patients should be able to check blood availability online.
3. The system should allow for registration online (HMIS Web Portal).
4. The system should allow the operator to search for existing registration record based on search parameters, as defined in the “Search” component.
5. The system should display the available Donor registration information already existing in the database when any of the parameters matches, during the registration of the Donor. If there is one or multiple records displayed, the operator needs to select any of the existing record, in order to avoid re-registration (if the Donor details being entered are same as the ones existing in the database) or else select the reason for not selecting any displayed record and going ahead with the new registration.
6. The system should allow the Donors to get registered. The system should allow standardization in recording Donor information. The registration receipt / donor card should contain the following information, but not limited to:
 - a. Bar Code (generated as per Unique ID)
 - b. Unique ID (having State, District, Year, and random unique system generated number)
 - c. Date and Time Stamp
 - d. Any other relevant information, as applicable
7. The system should generate the Donor Card in a pre-defined format, with the above mentioned details.
8. The system should allow the doctor / operator / Nurse to enter the vitals / general health details.
9. The system should capture the number of units donated by the donor. It is proposed that the system should have pre-defined criteria for the donor to donate blood at equal to or greater than specific time frame / intervals only, and the system should track the

frequency and period of blood donation by each donor.

10. The system should have personalized dashboard for Blood Bank having all information about donors, blood units available in different categories and requisitions from various departments.
11. The system should also have provision to capture the blood units collected through replacement units, along with all other related information about the replacement units. The digital stock information should be automatically updated by the system after the details are entered by the concerned User.
12. The system should have pre-defined list of cell and serum grouping, sample blood tests, which should be selected by the concerned operator / Blood Bank in-charge through user friendly select options.
13. The system should generate the bar-coded stickers to be attached to the Blood bags, having following details, but not limited to:
 - a. Blood unit ID
 - b. Blood related details like group etc.
 - c. Type (Blood, Platelets, and Serum etc.)
 - d. Barcode for easy identification.
 - e. Expiry date
14. The system should record the details of all discarded blood units. In case the blood is discarded after conducting the tests on the blood collected; the system should send an intimation / SMS to the registered donor about the same.
15. The system should have provision to suggest the near expiry blood /components to be issued in case requisitions for the same are received through the system.
16. The system should have provision to track requests from various departments like IPD, Emergency, OT, etc. The system should also have provision to track Blood requisitions from outside Hospital as well. The system should track all internal and external Blood requisitions through a separate unique Blood requisition ID.
17. The system should have option of marking the requisitions for blood units as “Emergency”, if they are required urgently.
18. A bar-coded tag should be attached to the sample container for easy tracking and the system should capture the blood sample details from the Patient for whom the requisition is made.
19. The system should cross match details of the blood sample and the blood unit available in blood bank. In case matching blood is found, the system should display the units

available. The system should allow the Blood Bank technician to update the status of the requisition and issue required units of blood.

20. In case of any reactions / adverse effects on the Patients" health, after giving blood, the same should be returned to Blood Bank and the system should capture the details and mark it for further analysis. Also the system should have provision to flag and even allow blacklisting of a particular donor in case the blood is found to be infected with disease or reactive.
21. In case the matching unit is not found, the requisition should be denied and the alert should be sent to relative / patient / department. The concerned doctor should get the alert about the unavailability of the required blood unit. If the digital database is integrated, other options are suggested by the system based on the information available. If there is no digital database, the information is provided by searching manual records, if any and status updated in the system.
22. The Fees collected from the Patient / relative is returned in this case and status should be updated in the system.
23. The system should have the capability to integrate with blood banks of public and private hospitals for availability check, in case of emergency and disease outbreak and also planning purposes.

4 Accounting and Billing

Accounting and Billing: This module is to be customized as per the requirements of Accounts and billing department of Medical College, Chandarpur.

This module should be linked with Purchase, Inventory, Equipment maintenance module.

The financial services take care of all system critical money-related information and ensure that the care provider is continuously maintained in a financially secure state. It permits the organization to take care of its current financial needs while being able to plan for future plan in order to provide better care on sustained basis. This module also to be covered the insurance requirements for private ward patients.

4.1 Patient Billing

The Patient Billing System provides the hospital with a comprehensive facility to track all charges for a patient from the point of registration to the point of discharge / completion of a visit. The module is largely parameter-oriented to make it more flexible to suit the hospital billing requirements. The billing process is flexible to enable inpatients billing to take place at pre-defined periods or at end of the episode, while for outpatients it can take place at each service point (either at the point the order is placed or at the point it is completed), or at the end of the visit. This application is fully integrated or interfaced real-time with other patient-care modules so that billing transactions can be automatically posted to the patient's account from the laboratory, radiology, operation theatres, pharmacy, wards/clinics and so on. Patient Billing will be integrated with Accounts Receivable.

This module needs to be customized based on the pricing policy and procedures of the hospital.

Accounts and Billing

- Charge Masters
- OPD Billing
- OP Services Billing
- Emergency Room Billing
- Day care Billing
- IP Billing
- Revenue Cycle Management

The various services under the Patient Billing module are given below:

Services

- Bed Charges
- Billing
- Payments Management
- Investigation charges

5. Services

5.1 Central Sterile Supplies Department (CSSD)

The Central Sterile Supplies Department (CSSD) application manages information pertaining to loans, exchanges of sets of sterile supplies to any department in the hospital that requires sterile supplies. The CSSD Module provides facilities to enter details of drums, packs and trolleys. Packs can be assembled or broken down into components as required. The assembly operation will automatically decrease the stock of the components and increase the stock of the pack. Similarly, dismantling the pack will do the reverse.

1. The system will be linked to the OT Scheduling system to enable required trays to be prepared and sent to the OTs based on the schedule of surgeries
2. The system will be linked to the Patient Billing System to enable automatic charging based on items used

The service under the CSSD module is given below:

Services

- Issue Tray Sets
- Receive Tray Sets
- Quality Control

5.2 Laundry Department

Laundry service is responsible for providing an adequate, clean and constant supply of linen to all users. The basic tasks include: sorting, washing, extracting, drying, ironing, folding, mending and delivery. A reliable laundry service is of utmost importance to the hospital. In today's medical care facilities, patients expect linen to be changed daily.

An adequate supply of clean linen is sufficient for the comfort and safety of the patient thus becomes essential.

The term 'hospital linen' includes all textiles used in the hospital including mattresses, pillow covers, blankets, bed sheets, towels, screens, curtains, doctors coats, theatre cloth and table cloths. Cotton is the most preferred and frequently used material. The hospital receives all these

materials from different areas like Operation Theatres, wards, outpatient departments and office areas. The OT linen materials need special care since it has to be washed & sterilized carefully.

- The system should be able to maintain a Linen data base
- The system should maintain the following registers and provide reports for the same
 - Linen stock register
 - Daily transaction register for wards
 - Daily transaction register for other areas

5.3 House Keeping

This module shall be customized as per the requirement of the Hospital.

5.4 Vehicle/Ambulance Management

This module shall be customized as per the requirement of the Hospital. This module should enable the hospital to make arrangements & be ready in advance/parallel for the critical patients that are on the way in an ambulance/any other vehicle so that critical time of the patient is not wasted in doing irrelevant formalities.

Mobile apps:

- Availability & tracking of ambulances.
- Tracking of nearest Health Centre.

Application & devices in the ambulance connected centrally.

Patient data synchronization with the hospital (vitals – BP, Pulse, Temperature etc.)

Availability of medical services during transit.

Preparation of needful procedures in the hospital before patient's arrival.

5.5 Miscellaneous Services

Miscellaneous Services: The miscellaneous services take care of all other system critical information that ensure the proper delivery of care to the right patient at the right time by the right people while maintaining the highest achievable degree of efficiency, quality and quantity of services at optimal costs.

5.6 Medical Gas Manifold System

This module shall be customized as per the requirement of the Medical College, Chandarpur.

6. Enterprise Resource Planning (ERP)/Back Office

It is proposed that all the backend support services including system support services will be part of the core HMIS solution.

It is envisaged that the different support services would be available as user friendly options within the support services module, which would be accessible to different types of Users based on access rights provided through the "Admin" module i.e. Role Based Access Control (RBAC).

6.1 Equipment Management System

There are two different aspects of this system, machinery and equipment management and planned preventive maintenance.

Machinery and Equipment Management

This system serves for the purpose of regulation, monitoring the Preventive Maintenance, Break Down and Over Haul works of the Components/Machines and costing thereof. The system envisages maintenance of equipment in multi-location environment. The Individual Unit History card will be maintained.

Planned Preventive Maintenance

The system will maintain a database of all equipment types by the preventive maintenance required, procedures they perform, spares required by them, services required by them, time duration of service (downtime of equipment during servicing), details of maintenance performed (in-house and through external agency), and services rendered by them.

The various services under the Equipment Management System module are given below:

- Maintenance Schedules
- Project Management
- Work Order Maintenance

These modules should be linked with Inventory Management and Finance Management System. These modules should to be linked for medical equipment and building equipment and their maintenance.

Equipment Management System Module

This refers to administration of all the equipments and assets of the hospitals used for Patient Administration Services, Patient Clinical Services and Support Services provided by different departments within the hospitals. This includes equipment visibility, utilization history, maintenance schedule and new requirements. e.g. biomedical equipments, security equipments, IT hardware, etc.

1. System should allow creation of a Machinery and Equipment Store and sub store
2. The system will have the ability to maintain separate Machinery Equipment (M&E) Asset records
3. System shall maintain a Centralized definition of Machinery Equipment categories, description across asset classes etc.
4. The system will have the ability to generate unique Machinery & Equipment number asset number at the time of asset entry in the system
5. The system will have the ability to maintain all relevant information about the M&E including:- Location, M&E description/specification, Supplier ID, Date since in operation/Installation, Life of the asset, Order No., Maintenance schedule of Asset.

6. The system will have the ability to retrieve details of all M&E for any location in the structure
7. The system will have the ability to consolidate M&E Registers at all healthcare facilities/department locations into M&E Register for the department
8. System shall have no restrictions on the number of M&E held.
9. There should be provision to record initial cost, description and book value of the Asset.
10. There should be provision to condemn equipments along with reasons and mode of condemnation and update the asset register
11. The system will have the ability to capture the current utilization and correlate working condition of the equipment based on the history sheet
12. The system will have the ability to plan, schedule, monitor/track and record maintenance activities.
13. System shall have provision to maintain and update the asset inventory when the asset is installed at a location or transferred to the other location
14. The system should allow define and maintain generation of maintenance schedules for preventive maintenance
15. The system will have the ability to generate maintenance and performance reports i.e. log books, defect lists, asset history, asset list w. r. t. location wise, inspection check list/ schedule, delay & down time, uptime analysis, asset wise consumables and other user defined reports
16. The system will have the ability to generate and schedule emergency maintenance work order.
17. The system will help in costing of the maintenance activity.
18. Should maintain business rules related to Track actual resources (tools, manpower, consumables, spares) utilization against planned / standards.
19. The system should send an alert to Maintenance cell In-charge who should then investigate the nature of the complaint and should be able update the complaint status in the system.
20. The system should be able to project the status if the complaint / request are not resolved as per defined timelines / SLAs and send alerts / intimation to the concerned hospital staff about the resolution of the complaint.
21. Tracking the history sheet of equipments.

22. Tracking of complaints / requests from various departments and status.
23. Categorization of complaints/ requests according to AMC / CMC / Warranty etc.
24. Seamless coordination with AMC / CMC agency and /or other technicians.
25. Standardized requests for raising and consolidating demand for new Machinery and Equipments.
26. Life of equipment should be entered with alerts for condemnation.
27. The system should have a provision to condemnation the equipment. This should be linked with utilization.

6.2 Inventory Management

Inventory Management primarily deals with the optimization of inventory and the supply chain processes for all non-pharmacy related items.

Inventory Control: The inventory control services take care of all system critical information that ensure that all medication and materials required for properly treating a patient are adequately stocked and maintained. All equipment and buildings are in a status of perpetual readiness and all instruments are constantly at the disposal of the care providers in a state that allows no injury to be sustained by the patient during the course of receiving care.

The various services under the Inventory Management System module are given below:

- Purchase Order Processing
- Stock Control

The inventory should include all the machineries, equipments, resources, items like lights, bulbs, pipes, fans, Air Conditioners, refrigerators, machineries in Gym, kitchen etc. Proper database of all these should be maintained in organised way. Alerts for non-functioning, maintenance of any of these items should be covered.

Complete Inventory Management Module under back office/ERP should be provided.

This module should be linked with equipment maintenance, purchase management & finance management system modules.

Inventory Management System should have at least the following functionalities:

- Manage Items
- Manage Stores
- Item – Vendor Management
- Tax Management
- Stock levels (Maximum & Minimum Stock, Safety Stock, Re-Order Level etc)
- Stock Taking & Adjustments
- Disposal
- Inventory Valuation Methods
- Inventory Analysis

Assets Management should have at least the following functionalities:

- Set Up Assets
- Procurement Cycles for Assets
- Install & bring into Book of Accounts
- Maintenance Schedules, AMC & Record Activities
- Transfer Assets
- Stock Taking & Asset Verification
- Depreciation & Residual value
- Retire/ Scrap Assets

6.3 Human Resource & Payroll Management

The Human Resources Management Department application captures information pertaining to various departments and the various human resources available. It maintains the records of recruitment, training and other records across the organisation. This application monitors the training details after receiving feedback from the departments; the system would be linked to the various departments to monitor data and details.

The various services under the Human Resource Management module are given below:

- Duty Roster
- Workforce Management
- Training Management
- Employee Performance Management
- Employee Self-service
- Payroll Management
- Grievance Redressal Management
- Attendance and Leave Management

This module is to be linked with Finance and maintenance module.

Online Duty Roster: It gives the report which shows the shift, leaves etc and calculates the number of person available in the shift. The duty roster to be created online which is to be integrated with biometric attendance system.

An integrated HMIS application with basic Human Resource Management System should be proposed, which shall maintain and manage staff information across various departments within a hospital. The proposed system should cover only the following aspects of HR function within the domain of Hospital administration:

- i. Postings and Transfers
- ii. Roster Management
- iii. Trainings
- iv. Deputations
- v. Leave

It is proposed that the HMIS should maintain the Employee master, Hospital master and Sanctioned Posts within the system, so that the above functionalities can be easily managed.

The HMIS may integrate with the existing HR system, if any, to achieve the functionality requirement.

Human Resources Management module should have at least the following functionalities:

- Project HR Requirements
- Resume Database
- Interview & Appointment
- Employee Management
- Organisation Structure & Chart
- Leave & Encashment Management
- Training Management
- Shifts Management
- Attendance Management
- Performance Management
- Rewards Management
- Discipline
- Retire Employees

Payroll Management module should have at least the following functionalities:

- Grade / Salary Fixation
- Tax Slab & Exemptions
- Employee Tax Declarations
- Employee Tax Filings
- Claims & Reimbursements
- Loans Management
- Bonus / Over Time Management
- Increment/ salary raise
- Payroll Generation
- Payroll Re-generation & Re-Runs
- Tax Reports
- Employee Self Service Portal

The SI/IT agency should provide the end to end solution for Human Resource (HR) Management as per the requirement of the hospital.

A complete end to end ERP solution should be provided to the Hospital as per the requirement if the same is not available in the HMIS application.

6.4 Finance and Accounts

An integrated HMIS application is proposed to manage the billing, consolidation and export of financial data across various departments within a hospital, to an external financial management system. The proposed system should cover only the basic book keeping. It may integrate with the existing accounting packages to achieve the functionality requirement. The system should capture

the payments made by the Patient for OPD/IPD/Casualty/diagnosis etc. at the payment counter. The payment details as captured in the system should be collated automatically and forwarded to the Accounts department. The collected amounts can be sent to Accounts department separately for compilation. The payment due from the Patients should be determined by the system automatically, based on pre-defined rules and parameters. The system should be able to check for possible exemption from payment of any fees by the Patient by searching the Patient category based on Registration details.

Accounts Management System should have at least the following functionalities:

- Chart Of Accounts
- Account Heads
- Currencies
- Home Banks
- Financial Year
- Budgets
- Book Invoices
- Register Advances
- Payments
- Accounts Receivables
- Accounts Payable
- Balance Sheet & Trial Balance
- Profit & Loss Statements

The SI/IT agency should provide the end to end solution for Finance & Account as per the requirement of the hospital.

6.5 Procurement

This module should be customised as per the requirement of the hospital.

Procurement Management should have at least the following functionalities:

- Purchase Request & Approvals
- Quotation Management & Approvals
- Purchase Order & Approvals
- Different types of Purchases (Rate Contract, Normal, Consignment etc)
- Goods Receipt Notes (GRN)
- Invoices & 3 way Invoice checks prior to payment

6.6 Record Room

It is envisaged that even with the deployment of a complete automated and integrated system, there would be requirements where a physical file is created by either compiling physical records or by taking printouts at certain stages in the entire workflow of a particular process, for record and reference. It is proposed that an online module should be developed

by the Implementation Agency, within the HMIS core application, to track the movement of such files from the desk of the concerned officials to the Medical Room / physical storage area and aid in fast identification as well as retrieval as and when required.

It is also proposed that the module will have a logical methodology to suggest the deposit of physical files in the record / storage room. The system will keep a record of all the files deposited in the record / storage room and all the files retrieved. The space for physical storage room will be provided by the hospital administration, however the Implementation Agency is required to create logical storage partitioning, as reflected in the system also. The identification of the physical files will be through the use of “Barcodes”.

The concerned personnel of the record / storage room (manager / in-charge) will receive the request from any of the hospital officials through system alert and as instructed would be required to print the required Barcode based on details entered into the system, and paste it onto the file. It would then be deposited by him / her in the record / storage room and the status would be updated in the system by logging in the system through his / her own credentials. Similarly the retrieval of the physical files maybe through use of Barcode reader which would be connected to the system and it may automatically update the status in the system.

It is a necessary requirement that the entire process should be secure and tracked through Audit Trail functionality in the HMIS core application. It is of utmost importance that the physical file or data should not be leaked from the storage room for any wrong intentions or for gaining personal benefits.

The detailed process of deposit and retrieval is mentioned below which should be implemented by the Implementation Agency:

- i. Creation & Storage of new Physical File:
 - The concerned official of Hospital / Record room manager enters the file details in the system.
 - A system alert is initiated to the Record room manager, in case the concerned official of Hospital is not entering the file details in the system. In this case the Record room manager will enter the file details as per the system notification / alert.
 - The system displays the storage point.
 - System generates a new barcode for the file. System updates the status “Bar Code created”.
 - The concerned person collects the file from the concerned hospital official and pastes the barcode on the file.
 - The concerned person hands over the file to record room

manager who deposits the file in the record / storage room and updates status in the system.

- A notification / system alert is sent to the concerned user.

ii. Retrieval of Physical File from Storage:

- Hospital official initiates request through system to record room manager with file details.
- On receiving the request, the record room manager retrieves the file from record / storage room and scans the barcode using the barcode reader. The system updates the status as “File Retrieved”.
- The record room manager sends the file physically to the hospital official.
- After receiving the file, the hospital official updates the status in the system as “Delivery Accepted”.

Note: The entire solution as described above should be automated and form a separate functional module in the HMIS core application. The Implementation Agency needs to define the solution with adequate System requirements and User Interface design.

7. Business Intelligence (BI) & MIS/Reports

7.1 Reports/MIS

System provides category wise dashboards which helps Management and decision makers to view the functional/ operational status at a glance.

Various categories for MIS are as following:

- Business Reports
- Statistical Reports
- Analytical Reports
- Desk Reports
- Departmental Reports

Additional requirement as per the requirement of client shall be covered under customization of application.

MIS Reporting

This will give authorized Users the ability to have a customized view of the entire list of reports they use or wish to use. Required security will be applied to this module providing a restricted access as per different category of Users within the Hospital. This module may be

further linked to the Personalized Dashboard where the same links to these reports can be displayed in small portlets, so that any User may not always search for their frequently used reports from the Reports module, and they can add it to their own dashboard for ease of use. All the reports made available need to be controlled through “Admin” module for variable access depending upon the nature and status of the USER. The access control list of the reporting servers needs to be mapped and configured with the admin access control policies.

Following are the kinds of reports proposed in the HMIS application:

- a. **All / Fixed Reports** – This subsection within the Reports module will have a list of all fixed reports as a hyperlink, which will display the reports as per pre- defined logic / query on the screen, with the option of exporting the report to different formats (PDF, HTML, word, excel or comma separated values), Print and Save the report. All these may be one click fixed reports or maybe dynamic to allow changes to only certain parameters (like date or period range through dropdown fields) in the pre-defined query and then execute the command to prepare the report.
- b. **Custom Reports / Adhoc Reports** – An UI interface will be provided to specific users that will give them view of HMIS database providing the ability to generate custom reports as and when required by selecting any particular field, table or column (as per Database design) by drag and drop feature. The UI will help form simple queries and execute them by providing the user with ability to select fields / tables from the display and enter certain basic parameters. The filter criteria and other user friendly features will also be provided for ease of use. The screen view of the report will be displayed and then the user will have option of exporting it to different formats as mentioned above. The key features of this functionality will be as follows:
 - i. This functionality will be permission restricted. Based on the type of rights / permissions granted to any user, they will have ability to view the tables of HMIS database through the User interface.
 - ii. Report Builder tool may be used to implement this functionality so that Users can easily create and execute queries by only entering the basic parameters. However the decision of HSCC/Client in this matter will be final and binding on all parties concerned.
- c. **My Reports** – This subsection will have a list of reports as a hyperlink that is frequently used by the internal users, as a kind of personalized section displaying only the preferred reports for any User. These frequently used reports will be a subset of the All / Fixed reports and would be bookmarked to appear on his / her personalized dashboard also, as customized by the individual Users.

The Reports generated by “Advance Analytics / BI” system shall be made accessible through an interface to be viewed by the designated users.

All the required reports, by each of the Health Administrators / Client / other stakeholders, must be immediately generated. The application architecture and the Database design must enable fast retrieval of data, supported by optimized HMIS application interface.

7.2 Business Intelligence & Dashboard:

Dashboards incorporating Key Performance Indices (KPIs) should at least the followings:

- Healthcare Performance – eg. diseases, time for case closure, disposition of cases etc.
- Hospital Operations - eg. occupancy, bed turns etc.
- Hospital Accounting - eg. revenue, margins etc.
- Procurement - Qty, Value, largest suppliers etc.
- Inventory - expiry, inventory turns etc.
- HR - people, vacations, training etc.
- Maintenance - MTTR, MTBF etc.

BI tools and analytics should be there. Top Management Dashboards, financial dashboards, operations dashboards & clinical dashboards should be provided.

Personalized Dashboard

The dashboard functionality should enable each of the key Hospital staff (Doctors, Anaesthetists, Surgeons, CMO, etc.) to view their virtual personal space and manage their tasks, organize their work etc. based on their roles and responsibilities in the Hospital functions and assigned privileges. This should be strictly privilege restricted section based on Role Based Access Control (RBAC) mechanism defined through the “Admin” module.

The following features are proposed for the personal Dashboard facility controlled through the “Admin” module for all the key internal users:

- a. **Quick Links** – Links within the application as well as external links to access any application module or website other than HMIS
- b. **Pending Activities/Tasks** – A list of tasks assigned / to be performed by the concerned User, arranged sequentially, along with number and type of tasks. The standard sequence of completing the tasks for all users should be First in First out (FIFO) sequence. To override the standard sequence, the concerned user will need to specify the reason and enter the details in the system. Audit trail would capture any such change in the system. An additional facility to view other Users tasks, if sufficient rights are provided (especially to senior hospital officials) should also be provided, but strictly controlled through “Admin” module of application. Senior Hospital officials in some cases might want to view the work load and performance efficiency of any junior staff in handling particular set of tasks. They may also want to reassign a certain task to themselves or to other staff

members, due to any administrative reason, and get the task completed. All such functionalities and features must be developed by the IA, while designing the automated processes within the HMIS application.

- c. **History of Completed Activities / Tasks** – All the completed activities should be displayed to the concerned User, in case they want to refer it in future. User friendly features like pagination or drill down to see further details of the completed tasks may be provided, as required.
- d. **MIS reports** (Fixed and Adhoc / Customized reports) – which may be bookmarked from the Reporting module of the system; and
- e. **Red Flags** – notifications, alerts etc. as per pre-defined logic or escalation matrix

Note:

1. This is mandatory requirement to be implemented for HMIS.
2. The above features and functionalities are only indicative and additional features may be included in the Dashboard module by the HSCC/Client / actual users / module leaders. It is envisaged that the Dashboard functionality will be different for each functional module / department within a hospital as well as for each individual, catering to their specific needs, and they should be able to dynamically configure their dashboards as required. The Implementation Agency must develop all the required functionalities in this module, as directed by the module leaders, and also by HSCC/Client from time to time.
3. Also, the personalized dashboards should be designed Role wise and should be different for each User. Implementation Agency must take inputs from the actual Users to design the structure for module based dashboard. The various functional requirements may also be referred for better understanding of the dashboard requirements.
4. The Implementation Agency is required to analyze the re-engineering components in order to adequately build this functionality in all the processes of HIS. It is also a mandatory requirement that all the processes should be interlinked to share data / information, and also to 'Admin' module so that access rights and content can be dynamically controlled as and when required by HSCC/Client themselves.

8. Others

8.1 Maintenance Cell

1. The system should allow the authorized hospital staff to raise a complaint / request through the system in case of any maintenance issues.

2. The system should send an alert to Maintenance cell In-charge who should then investigate the nature of the complaint and should be able update the complaint status in the system.
3. The system should automatically check and suggest the Maintenance cell In-charge if the faulty unit / process are covered under AMC/CMC/warranty and if it is in condition of repair as per the “History sheet” maintained by the system.
4. If the concerned unit / process is covered under AMC / CMC/ warranty and the same is in condition of repair, the Maintenance In-Charge should be able to notify the concerned external Agency for resolving the problems under AMC / CMC/ warranty. In cases where the external agency has the facility to receive an email or SMS request, the system should automatically generate a request / complaint for maintenance / repair as covered under AMC / CMC and send to the external agency. It should also allow to manually generate the request. The details should be updated in the system for further reference and follow-up. If the Maintenance cell In-Charge makes a call to a specified number for the agency, and records the request for maintenance / repair. He should be able to enter the details in the system for further reference and follow-up.
5. The system should be able to project the status if the compliant / request is not resolved as per defined timelines / SLAs.
6. If the concerned unit / process are not covered under AMC / CMC/ warranty, the concerned Technician / Vendor are called to rectify the problem and status should be updated in the system.
7. The system should send alerts / intimation to the concerned hospital staff through the system about the resolution of the compliant / request. The concerned hospital staff verifies the resolution and should record the status as closed / reo-open etc.
8. The system should be able to track and record the History sheet maintenance, utilization record of machines, data of breakdown time, scheduled alerts regarding annual maintenance/warranty/breakdown/ preventive maintenance checks and CMC. Regulatory requirements/licenses / permits and compliances should also be recorded and necessary alerts should be generated for renewal / compliance of the same automatically by the system.

8.2 Complaint Management System/Grievances (Patients & Hospital Staff):

Complaints are inherent in every work environment but in healthcare services, complaints are critical, needing immediate resolution. System Integrator shall manage it in following manner

- Complaint forms are activated for Each and Every Department.
- Authorized User can send the complaint to Admin or Person in Charge where he receives a system generated sms & email for confirmation of complaint submission.

He also gets the contact person of the concerned person/officer in charge to whom the problem can be communicated for faster rectification/resolution.

- Person in charge acknowledges these complaints and Prepares and action plan. Person in charge also received the sms & email alerts every time a complaint concerning to him is raised via the system.

Once the action is taken acknowledgement send to the said department which in return agrees and the complaint is closed. User provides feedback of the action taken on the mobile app/portal or sms and in case the problem still persists, he should receive a sms & email with contact details of next higher authority concerning that department who can help to resolve the issue quickly.

8.3 Hospital's Website / Web-portal

ENT Hospital's website to be used for projecting the organization worldwide and provides the information about Hospital for various services and facilities. Website shall contain information but not limited to the followings:

- Details about the Hospital infrastructure
- Various facilities and services like Emergency, Blood Bank, CT-Scan, MRI, ICU etc.
- Departments
- Appointment booking for Consulting doctors in OPD/IPD
- Appointment cancellation / re-scheduling
- Reminder via e-mail, SMS etc.
- Health related news and tips
- Course and training program organize by college
- Patient portal so as to enable patients to view their reports online, make online appointments, make online complaints & track them, can view e-prescriptions online etc.
- Static Web Content
- Public Reports / Statistics
- Information Components & also information from HMIS
- Search Component
- Payment Component
- Interface Component
- Authorization/Approval Component
- Other information and functionality to be covered as per the requirement of the hospital

Hospital's website shall contain all the guidelines issued by Medical Council of India for Hospital's website.

Web portal should be interfaced with HMIS to give online OPD schedule, department facilities available etc.

If required, third party audit should be done as per the client's direction for security features of the website. Charges for this is to be included in the HMIS cost. No extra charges shall be paid for this work.

Website Content Management

A “Content Management System” (CMS) within the HMIS core application is envisaged, allowing Hospital administrators to dynamically update elements / sections / contents / forms / formats / notices etc. that change regularly, without the constant need of a web developer. The CMS should offer easy administration of the overall HMIS Application, simply requiring nominated and authorized staff members to log-on to a secure area of this Application and complete simple web forms and upload to the centrally controlled database, so that the changes are reflected throughout the Application pages / sections, as applicable. The formats for various reports / notices and other communications like promotional messages can also be designed through this module and uploaded on to the HMIS application.

Other Requirements:

1. Patients Feedback System at time of Discharge via tablet/ kiosk

Hospital should have customized feedback form based on the services given. Those can be individual portal or linked to the website of hospital.

- Patient just has to give ratings for the services along with overall experience in remarks.
 - Reports can be generated based on the ratings which namely are as service name- Unsatisfactory, Satisfactory, Good, Excellent etc.
2. System should be available on Tablets/Laptops/mobile (with mobile apps).
 3. System should fully comply to Indian Health standards, if any.
 4. Health records should be fully inter operable on CCDA Standard.
 5. System should have clinical decision support system (CDSS).
 6. System should have its application working on local storage i.e. should also work directly in mobiles, desktops other than browser based interface.
 7. System should work on offline environment i.e. in case the network is down, the application should continue to work and all the patients data should automatically be synchronised when the network is made available.
 8. System should have machine learning feature and all the concerned characteristics of artificial Intelligence.
 9. System should allow patients to enter their important credentials/fields regarding their demographic data, symptoms, family, social history & other relevant details concerning the patient.

10. Troubleshooting, Bug Removal, Fine tuning, Administration, Management and maintenance of HMIS as per the satisfaction of the designated officials of Medical College, Chandarpur during Implementation Phase, Warranty and guarantee period or during the contract period (whatever the case may be) in such a way that HMIS is maintained in good working condition and to ensure fault free operation of the system for 24 hours on all days including holidays and Sundays.
11. Updates and upgrades to be provided along with their integration in HMIS during implementation, warranty and ACMC period or during contract period (whatever the case may be). After implementation of Updates and upgrades in HMIS, HMIS to be thoroughly tested by the joint team consisting of representatives of the service provider and representatives from client.
12. Regular onsite training should be provided to respective users of all modules during implementation, guarantee, warranty and ACMC period of contract whatever the case may be.
13. HMIS Solution should have easy and customized data backup and retrieval facility.
14. Interfacing with medical equipment having USB/IR/RJ45/RS232/ Parallel interface etc. should be done. For interfacing purpose, all the hardware & software should be arranged by SI/agency without any additional charges.
15. HMIS Solution should be integrated with Biometric Technology, Smart Card Technology, Barcode technology, Electronic Signatures, Queue Management System, SMS Gateway, Payment Gateway, RFID, IVRS, Hand held devices etc.
16. From interoperability point of view, HMIS should conform to the existing standards and policies defined by Government of India. Capability to implement the upgrade in these policies as and when defined should also be there.
17. HMIS solution should allow the user to navigate freely depending upon the user access permission and role based access.
18. HMIS solution should have provision to authenticate user with Biometric devices/ Smart cards etc. User data should be stored in encrypted form in the database. Along with this, authentication on the basis of National id is also required.
19. HMIS solution should have structure of technical document i.e. SRS (Software Requirement Specifications) related to various modules of HMIS should include all the workflows. DFD's etc. detailing out all functionalities.
20. Concerned user should be involved at the software design stage.

21. All sub modules of HMIS should function in integration with each other in such a way that there should be flexibility in various information flows. The software should be able to deal with all practical issues and through flexibility should be built in. And, the ability to transmit information electronically between various modules without duplication of data entry should also be there.

22. The HMIS should be interfaced with:

- SMS interface.
- Lab & Medical equipment.
- Tablet & Mobile.
- Barcode & RFID.
- Smart Card.
- Stylish pen & note pad.
- Wrist bands
- Voice Recognition.
- Drug Database.
- Digital Signature.
- Online photography of patients.
- Payment Gateway and credit/debit card swipe machines
- Third Party Solutions
- Biometrics
- SMS Gateway & e-mail server/gateway.
- Any other device/service/gateway as per the requirement of client.

All the necessary arrangements and devices to be provided as per the requirements for above interfacing.

The HMIS & PACS applications should be integrated & interfaced with medical equipments for data exchange without any incompatibility.

Smart cards & HMIS & other applications should exchange data either through API sharing or by other means.

Barcode should be able to read, write & printed by HMIS application. HMIS should also read & write data from & into the wrist bands.

Notepad/Clipboard based e-prescription for filling EHR of patients: Consultants/doctors can write the e-prescription along with patient's vitals, symptoms, etc. in a pre-defined form which automatically gets filled against the patient's EHR in the e-Health application.

23. Drug Database that is to be provided with at least one year license should have following modules:

1. DrugInfo
2. Drug Alert
3. DrugAllergyAlert
4. DrugHealthAlert

5. DuplicateAlert
6. DrugDoseAlert
7. DrugPregnancyAlert
8. DrugLactationAlert etc.
9. Drug to ICD & SNOMED-CT codes
10. Overdose Alerts
11. Any other as per the requirement.

Alerts for Drug Abusers VIP patients etc. should be generated for persons whose records/data is already available in the system.

24. Automated Information about doctors

Information about:

- department
- doctor's room number
- Services (Laboratory, Radiology, Pharmacy etc.)

based on health issue/complaint of the patient through mobile application.

25. Health & Diseases Surveillance

Alerts to prevent flow of communicable diseases during entry/exit.

Separate database for tourists.

26. Real Time Patient Monitoring

Continuous health monitoring on the equipments integrated with Hospital Management & Information System (HMIS).

Real time measurements of blood pressures, pulse rates, respiratory rates etc.

Alerts/notifications on mobile apps, sms, email & other means.

GPS/Mobile app/Wrist band based real time tracking of patients even inside the hospital premises.

Alerts for removal of wearable patient monitoring devices like wrist bands etc. by patients.

Monitoring of critical/IPD patients centrally from nurse station by in-built or third party integrated applications. Generation of alerts as per different scenarios in synchronized manner.

27. Mobility

View EHR of self or dependents.

Prescription management for physicians/doctors.

Home vitals monitoring.

Maintain/schedule/edit Medical Calendars.

Physician app/portal (Inpatients as well as outpatients) for global access of patient data.

Appointment management.

28. Patient at home

Home Monitoring Apps at patient's Home

Devices for Monitoring of vitals - BP, Temperature, Respiratory Rate, Pulse, Oxygen saturation, ECG etc. Interfacing with the Hospital EHR.

29. Mother & Child

- a. Automatic generation of the complete schedule & sms/alerts for:
 - i. All medications.
 - ii. All vaccinations.
- b. Follow ups/home visiting for compliance.
- c. Monitor growth of the child as per standard measurements like body weight etc.
- d. Alerts for abnormal measurements.

30. Referral Creation – Maintains list of referral sites by specialty, reason for referral, location. Maintains referral history (patient, site and reason/diagnosis). Ability to generate reports by patient, reason/ diagnosis, referral site.

Information about all the facilities & services offered in various hospitals & health centres in Chandarpur for referral.

31. Patient Billing, MLCs & Certificates

Periodic expenditure & billing records:

- a. Patient wise – Gender/Age wise.
- b. Family wise.
- c. Area wise.
- d. Disease wise.

Claims as per medical/health insurances.

Police Reports – Medico-Legal Cases (MLCs) etc.

Births and Deaths Registration & Certificates.

32. Services Management

Complaint management system for real time registration of complaints by the patient & hospital staff via:

- a. Helpline Number.
- b. Portal/Mobile Application.
- c. Helpdesk counters.

Reports on number of complaints registered, resolution time etc.

Real-time updation of maintenance assets & their stocks.

Doctor's rating by Patients.

Patient's rating by Doctors.

33. Reorder Level & Procurement

Maintain availability of Drugs and other inventory.

Maintain minimum stock level.

Process – Indent/request should be automatically generated as per requirement/re-order level of items. Automatic NIT should be generated & after getting approval & performing procurement process, automated purchase order should be generated. When the items are supplied, the stocks should be automatically updated and should be ready for issue to required departments, locations.

34. The proposed HMIS should have the following features:

- Multiple level Security
- Graphical User Interface
- Online Help & User Manual
- Web enabled (Complete system can be deployed on web or as per the requirement of hospital.)
- Voice transcription in PACS

35. The system uptime will be 99.5% in non-critical areas

36. The system uptime will be 100% in critical areas

37. The system should be able to generate turnaround time (TAT) report for OPD consultation and lab and radiology result reporting, patient discharge timing and also should generate average length of stay report.

38. The system should facilitate creation of requirement specific discharge summary templates.

39. The system shall support EHR guidelines and other guidelines etc. provided by the Government of India.

40. The application should have online updation of the transaction in to the Back office Finance/Inventory.

41. The application should have highly secure web interface for doctors and radiologists & secure Application should protect the patient data.

42. The SI shall adherence to all relevant e-governance standards defined by Government of India from time to time.

43. Compliance with Industry Standards

The Solution shall be based on and compliant with industry standards (their latest versions as on date) wherever applicable. This will apply to all the aspects of solution including but

not limited to design, development, security, installation, and testing. There are many standards that are indicated throughout this volume as well as summarized below. However the list below is just for reference and is not to be treated as exhaustive.

Information access/ transfer protocols	SOAP, HTTP/HTTPS
Interoperability	Web Services, Open standards
Information Security	System to be ISO27001 or equivalent compliant
Operational integrity & security management	System to be ISO17799 or equivalent compliant
IT Infrastructure management	ITIL / EITM specifications
Service Management	ISO 20000 or equivalent specifications
Project Documentation	IEEE/ISO or equivalent specifications for documentation
Internet Protocol	IPv6 ready equipments
UHID	Unique Health Identifier, as a unique (primary or secondary) patient identifier.
Medical standards	DICOM 3.0 Compliant
Imaging	Picture Archiving & Communications System (PACS)
HL7 Clinical Document Architecture - Interoperability standard for exchange of electronic health information	Likely to be used for exchanging the clinical documentation between two EHR solutions both within an organization and outside
HL 7 V2.x	Seamless handling of inbound and outbound HL7 messages from any system that has similar capabilities; V2.3 or above
HL 7 V3.0 RIM	Reference Information Model: Intermediate recommendation; to be replaced with HL7 FHIR when it is accepted by BIS/HL7-India
HMIS Application	Web enabled application, Web 3.0
Universal standard for identifying medical laboratory observations	LOINC Coding - Logical Observation Identifiers Names and Codes

WHO ICD 10 for Disease Classification	ICD-10 coding - the international standard diagnostic classification for all general epidemiological, many health management purposes and clinical use.
Clinical Healthcare Terminology	SNOMED-CT Coding - a Systematized Nomenclature of Medicine – Clinical Terms. Provide comprehensive clinical granularity, used to capture problem list, allergies, diagnosis, procedures etc. – will immensely aid in clinical analytics, clinical decision support systems, automated clinical care pathway management systems, support evidence based practice, etc.
ISO 18308	Reference EHR Requirements Specification, the latest version.
CEN / TC 251 EN 13606	Reference Model & Archetypes, the latest version.
Investigations	Investigations coding, Results coding.
Equipment compatibility	All equipments will be used with international bench-marks that are workable in India

44. Performance Metrics

Some of the key considerations that the implementation agency should aim for while designing the deployment architecture is to ensure that the HMIS project meets SLA requirements, standards, specifications and performance prescribed, by ensuring that the following are associated with clear, quantifiable metrics for accountability:

1. Performance
2. Availability
3. Security
4. Manageability
5. Scalability
6. Inter-operability & Integration
7. Standards and protocols

The solution must be designed to meet all functional, non-functional and management requirements as mentioned in the document. Some of the key acceptance criteria are defined in

the table below.

	Requirements
1.	<p>Performance - The system should provide fast and steady response times (Quality of Service). The maximum user response time should be less than 3 seconds over WAN and less than 1 second over LAN, for the next screen to appear or the existing screen to refresh for submission of data. The speed and efficiency of the system should not be affected with growing volumes, especially during search operations, reporting, MIS, online processes and batch processes.</p> <p>The system should be operational with good response time using low band width in the hospital of about 32Kb per user, especially for LAN and internet users.</p> <p>The system should support high variance in frequency as the volumes are not expected to be constant and may be subjected to variances in user behaviour.</p>
2.	<p>High Availability – All the components of HMIS must provide adequate redundancy to ensure high availability of the HMIS applications. The systems shall be designed for 24x7 operations and meet all SLA requirements. Designing for availability assumes that the systems will fail, and therefore the systems must be configured to recover from component or server failures with minimum application outage. All the components of HMIS should support SNMP protocol for the effective monitoring and management.</p>
3.	<p>HMIS should be available for 99.5% of the planned uptime. The accepted planned downtime should not be more than 60 minutes per month (2 alternate Sundays in a month at around midnight). The Implementation Agency needs to indicate the critical components in the system and indicate the plans for fail-over mechanisms.</p>
4.	<p>Security – The implementation of HMIS components for each of the project locations should comply with the standard guidelines of Information Security Management System (ISMS). The Implementation Agency is expected to implement ISO 27001 or equivalent for the project and should formulate standard security policy and procedures applicable for each of the entities separately.</p> <p>The Data Center Services are already as per ISO 27001 or equivalent standards.</p>
5.	<p>Requirements Manageability (Version Control and Management) – The proposed System must have versioning features to track and document and process revisions made. A tool may be used for version control. The admin control of the tool will always remain with Client.</p>

6.	Scalability – All components of the HMIS must support scalability to provide continuous growth to meet the requirements and demand of HMIS. A scalable system is one that can handle increasing number of requests without adversely affecting the response time and throughput of the system. HMIS solution should support vertical scalability (the growth within one operating environment) and horizontal scalability (leveraging multiple systems to work together in parallel) by the use of load balancers and High available servers. A scalable HMIS solution shall easily be expanded or upgraded on-demand. Scalability is important because new proposed components shall constantly be deployed.
7.	Inter-operability - The entire system with all subsystems should be interoperable and must seamlessly integrate with other legacy applications and the applications being developed / already developed by Government of India for similar purposes. Operating systems and storage technologies from several suppliers must interact well with each other. These systems should support the open architecture solutions such as XML, LDAP, SOAP, etc. where information/ data can be ported to any system, whenever desired.
8.	Access and Interface – The systems must be user-friendly, intuitive and equipped with help / support facilities.
9.	Server Based Computing – The computing architecture must be Server based. The applications will reside in the servers and will be accessed to the users through other Browser based computing facility / technology.
10.	Application Client – The clients should be supported on latest versions of all popular browsers such as Internet Explorer, Chrome, Netscape, Mozilla Firefox, etc. It should also be multi channel, compatible to web as well as mobile / handheld devices.
11.	The system should be web 3.0 compliant to ensure the HMIS application works on various platforms, browsers and resolution.

45. Application Architecture

- The application architecture should be such that it has capability to deliver the expectations of the Medical College, Chandarpur. Following are some of the salient points that are desired from the architecture design:
 - Scalability
 - New servers can be added dynamically to increase capacity
 - Load balancing can be used to ensure that the servers are proportionately utilized
 - Performance
 - Application framework designed to ensure good performance
 - Use of caching techniques
 - Security

SSL

- Data encryption
- Firewall provides security from outside attacks
- Application level security in terms of user roles & responsibilities
- Security must be addressed through OS security and application Security. Please give details of the security architecture for the following
 - Log in security
 - Network security
 - Operating System security
 - Application related security
 - Antivirus measures
 - Intrusion Detection measures
 - Intrusion prevention measures
- Availability
 - 24 x 7 availability
- Proposed architecture of the servers/data centre can have the virtualization. The number of servers should be minimum with high performance to fulfill all the requirements. Virtualization should be preferred over the other proposals for application architecture.

46. **Audit Trail** – the data once entered cannot be changed without proper permissions. If any changes are made, then full audit trail information related to the date and time of user login and logout, data entered, data modified, data viewed etc. has to be kept to keep track of what changes are made by whom and when. Provision to modify/cancel all transactions (with their transaction details in audit trail) by only authorized officials should also be there.

47. **Alerts** – Provision to define configurable alerts for every critical event should be available along with capability to send these alerts to the concerned officials on their mobile phones (including SMS) & e-mails should be available. In-built automatic alerts, wherever appropriate, shall be incorporated.

48. **Reports** – All reports should be available for downloading in Excel and PDF format to authorized users.

49. **Validation** – Each input field shall be properly validated before the acceptance of input according to the type and range of the input. In-built validation checks for each field should be available to avoid invalid data entry.

50. All policies of Medical College, Chandarpur (functional/administrative) should be implemented in terms of parameters.

51. Ability to access processes of any module/sub-module wherever required and in whichever module as per the Medical College, Chandarpur functionalities.
52. Helpdesk services to be provided. Helpdesk services should include problem resolution to the level of the end user's desk. Helpdesk will be used also as a call centre for customer support. Toll free no. be provided by Medical College, Chandarpur.
53. Propose Administration/ user Data access policy as per industry's standard practices and submission of same to Medical College, Chandarpur for approval. After approval implementation of same in HMIS.
54. Easy and customized data backup and retrieval facility.
55. HMIS should be integrated with existing HMIS or any other application of Medical College, Chandarpur for exchanging information/data as per the requirement of the hospital.
56. HMIS should be integrated with other HMIS solutions in Chandarpur if required without any extra cost.
57. HMIS should also be integrated with any other application or portal launched by Govt. of India/Gujarat during its implementation & maintenance period without any extra charges.
58. Walkthrough for complete patient flow from patient's entry (for OPD & IPD both) to their exit has to be prepared and submitted to HSCC/client covering all the floors and functionalities required in the HMIS solution. No extra charges shall be payable to the SI.

59. Acceptance Criteria

Security

The Implementation Agency must take rigorous provisions to prevent unauthorized alteration or damage to HMIS application, and all related applications and databases. The Implementation Agency must describe in detail all measures to be taken, including the use of security infrastructure including end-point security, Security Policy and Procedures for each project location, applicability of the policies and security controls for physical, communication, assets, software licenses, equipment security etc. as per the ISMS procedures. Implementation Agency shall provide basic level of security by providing the end users with username and password to access the applications. Implementation Agency shall deploy the application only after it has undergone User Acceptance Testing (UAT) and is security audited for vulnerability assessment (VA) and penetration testing (PT). The UAT shall also include assessment and evaluation of all application SLA's However Implementation Agency shall undertake and conduct all sorts of testing and follow a standard Software Testing Life Cycle approach (STLC) before deployment of application in a production environment in addition to assessment and certification. Content Management Software that is part of the portal shall be restricted to specific IP

sources. Additional layer of security shall be provided to sensitive applications by deploying these behind Application Firewall.

The Governance Framework established for the project shall ascertain what all measured risks that needs to be accepted; however Implementation Agency shall at each such occurrence/incident be responsible for providing resolution in terms of correction, prevention and remediation throughout the project tenure.

60. Backup and Recovery

The Implementation Agency must design and successfully test backup and recovery capabilities as provided by the Data centre Service Provider for the HMIS application The Implementation Agency must describe this functionality, the frequency of backup and provide reports to Client/HSCC. It is a must, that the facility to conduct such tests/audits should be provided to Client/HSCC or any other nominated agency on behalf of Client for audit purposes, as and when required. At each hospital facility, Implementation Agency shall be responsible for data storage, backup and recovery measure that will be taken at individual facility separately.

61. Development / Customization Criteria

In order to achieve the high level of stability and robustness of the application, the exception arising due to internal / external factors. This will help ease of application system development life cycle must be carried out using industry standard's best practices and adopting the security constraints for access and control rights. The various modules / application should have a common "Exception Manager" to handle any kind of maintenance and enhancements. Similarly the modules/ application should be supported by the "Session" and "Transaction Manager" for the completeness of the requests.

The software application must be developed / customized in a suitable environment as agreed in the discussions with HSCC/Client. The Implementation Agency must justify the choice of development environment. The application must be developed / customized and hosted utilizing industry standard with commercially available tools. The Implementation Agency must list all tools to be used to develop, customize and maintain the application, as well as the hosting platform, hardware and software, and seek prior approval of HSCC/Client. Implementation Agency shall propose and setup a dedicated "Development / Customization" environment and provide remote monitoring access to HSCC/Client for the same.

It is proposed that the customization of HMIS core application may be allowed to take place outside Hospital/site premises; however, it is proposed that for all the on-going upgradation / enhancements and maintenance activities needs to be done within the development environment set up by the Implementation Agency within pre-decided premises only. The Implementation Agency must comply with all the IT and admin requirements as defined by HSCC/Client.

Note: In case the Client / HSCC agrees to continue on-going up gradation/ enhancements and maintenance activities from outside location, the Implementation Agency needs to define the environment and provide necessary controls / access for adequate monitoring to authorized officials.

The Implementation Agency must take all reasonable care to protect the integrity of the software application during development / customization. Use of a version and library control tool is required. The Implementation Agency must describe the development environment to be used and tools deployed for maintaining the version control of the software application. The access control of the version control tool must be provided to HSCC/Client or any agency nominated by Client for periodic review of logs and Audit of the entire development process.

62. Project Management and Plan

The Implementation Agency must provide an experienced Delivery Manager to oversee the development/customization of the application and serve as primary point of contact for HSCC/Client. The Implementation Agency must follow an established Project Management methodology conforming to the best practices of the Project Management Institute. The Implementation Agency must describe the methodology to be used.

Within one week of award of contract, the Implementation Agency must provide HSCC/Client an Inception Report including a detailed Project Plan for the development / customization of the application along with the Performance Management System (PMS) tool. This Project Plan must include the Project Charter, a work breakdown structure showing all proposed milestones and deliverables, and a listing of all project issues and risks. Additionally the Implementation Agency will also be required to submit the detailed CVs of all resources being deployed for providing services to HSCC/Client and also the "Resource Plotting" sheet as per project plan.

The Implementation Agency must provide weekly status reports to HSCC/Client during the development effort as well as the entire project implementation and maintenance phase, for the entire contract period. These reports must be submitted by close of business each Monday and reflect status against the Project Plan as of close of business the previous Friday. Any falsification of these status reports or failure to inform HSCC/Client of issues impacting the deliverables or timeframe of the project may result in imposition of adequate penalty / action by HSCC/Client.

63. Version Control and Bug Fixing

The Implementation Agency must make any modifications necessary for the duration of the contract to ensure that the system is compatible with current and supported versions and releases of the relevant operating system and other system software with all relevant documentation. It is a mandatory requirement that all relevant documentation be created,

updated and maintained throughout the contract duration. The Implementation Agency will also ensure that proper track of all bugs are maintained and are fixed as per various tests conducted on the application. It is desirable that the Implementation Agency maintains a bug tracking tool for the purpose.

64. Future Changes / Application Upgrades

From time to time, changes in work process, legislations, policies, etc. may necessitate changes in the HMIS application. The Implementation Agency must make any and all such changes for the duration of the contract as defined in the “Change Control” procedure.

65. Testing Criteria

A thorough testing is proposed for the HMIS application and its modules, as per standard process defined hereunder. HSCC/Client requires thorough and well-managed test methodology to be conducted. The SI must build up an overall plan for testing and acceptance of system, in which specific methods and steps should be clearly indicated and approved by HSCC/Client. The Implementation Agency is required to incorporate all suggestions / feedback provided after the elaborate testing of the HMIS application, within a pre-defined, mutually agreed timeline.

The Implementation Agency must undertake the following:

1. Outline the methodology that will be used for testing the system
2. Define the various levels or types of testing that will be performed for system
3. Provide necessary checklist/documentation that will be required for testing the system
4. Describe any technique that will be used for testing the system
5. Describe how the testing methodology will confirm to requirements of each of the functionalities.
6. Indicate how one will demonstrate to HSCC/Client that all applications installed in the system have been tested

Competent Authority from HSCC/Client shall issue application security audit certificate to Implementation Agency after successful installation

The Implementation Agency shall conduct various type of testing on the new build/package before releasing it for deployment on the production environment according to standard Software Testing Life Cycle (STLC). These tests shall include unit testing, system testing, security testing, stress testing, reliability testing, performance testing, audit trail, multi-user capability, volume test, system integration testing, compatibility and configuration testing, GUI testing etc.

The test documentation shall include test procedures, test data and test results should be documented. Errors detected during testing should be logged, classified, reviewed, and

resolved prior to release of the software. Software error data that is collected and analysed during a development/customization life cycle may be used to determine the suitability of the software product for release and installation. Test reports should comply with the requirements of the corresponding test plans.

The acceptance tests must demonstrate that the Implementation Agency has met each and every requirement specified in the RFP and has delivered an effective operational system.

66. User Acceptance Testing (UAT)

Client will form different user groups which shall be headed by a competent officer appointed by Client for the purpose of UAT. These user groups would test the application for the functionality, reliability and all other related tests. Once the users are completely satisfied with the application, Implementation Agency should take a formal sign off from the competent officer appointed by Client for acceptance of each module. Based on the sign off and user feedback, Client with the assistance of Project Management Unit (PMU) or any other nominated agency would issue UAT certification to the Implementation Agency for that particular module/ sub-module. In addition to conducting a UAT testing, HSCC/Client shall conduct an application security audit including vulnerability assessment and penetration testing. User acceptance testing shall also include testing of application SLAs.

67. Acceptance Test Design and Execution

All the acceptance test criteria shall be specified by Implementation Agency and finalized under the technical guidance of Project Management Unit and the user representative authorized by the HSCC/Client. The test criteria should be comprehensive to address all aspects of testing the new systems. Extensive testing would be carried out by the User Representatives with technical support from Project Management Unit (PMU).

68. Fault Correction

The Implementation Agency will be responsible for correcting all faults found during the acceptance process at no extra cost to HSCC/Client. The Governance Framework established for the project shall ascertain what all measured risks that needs to be accepted; however Implementation Agency shall at each such occurrence/incident be responsible for providing resolution in terms of correction, prevention and remediation throughout the project tenure.

SI will undertake an exercise of application security audit of the HMIS solution, as soon as the Implementation Agency declares the completion of system implementation.

69. DOCUMENTATION

- a. Documentation in respect of all sub-modules (general user manuals and admin user manuals) is to be provided after implementation/acceptance of each of the sub-modules and implementation of amendments in the sub-module. The manuals should also include instruction manuals.

- b. Documentation in respect of approved and implemented Data Access Policy.
- Documentation shall include User manuals, Administration manuals detailing out all HMIS administrative activities from the point of view of HMIS's Installation procedure, Configuration, Backup and Recovery, Security policy, Access policy etc.

70. Risk Management

Risk is an important element of any project. It provides an estimate of the magnitude of the unexpected outcomes (the surprise factor) on the project. A project management methodology is not complete without a forward looking risk management component. This aspect of Project Management runs through all the phases of the Project implementation. All processes are monitored continuously for adherence to quality and any risks or deviations are immediately attended to and rectified. Some of the main objectives of this aspect of project management in case of HMIS project will be:

1. Identification of high, medium and low risk areas and pain points
2. Identification of Risk Mitigation Methods and implementation plans
3. Tracking, monitoring and reporting risks to previously defined authorities
4. Implementation of alternate strategies at appropriate times
5. Observance of all Quality aspects including documentation, process control and strict adherence to Service Level Agreements (SLAs).
6. Implementation of alternate strategies at appropriate times

For this project a simple yet very effective risk management approach is being proposed. There will be a periodic review of the risk management component, which will be evaluated jointly with Client/HSCC, and a recommendation will be presented for the way forward. The risk management program will require the project management team to report their top risks looking forward and propose a response to proactively deal with them. This approach is the simplest way to direct the project delivery team to elevate themselves above the day -to-day issues and past performance.

Owing to the nature of the project and the far-reaching consequences that it has in functioning of Medical College, Chandarpur, other Health institutions as well as on external interactions, risks associated with delays and those relating to change management issues are envisaged.

Implementation Agency shall adopt suitable Risk Management methodology to mitigate all risks envisaged under the contract. Implementation Agency shall underwrite all the risk related to its personnel deputed under this contract as well as equipment and components of the HMIS application, equipment, tools and any other belongings of the Implementation Agency during the entire period of their engagement in connection with this contract and take all essential necessary steps to reduce and mitigate the risks.

Implementation Agency should identify all possible risks & propose the mitigations to them.

2) Picture Archiving and Communication System (PACS)

The Picture Archiving and Communications System (PACS) is intended to setup a film-less system in Hospital Block for performing radiology services within the institution. Anticipated benefits of implementation of the system include significant reduction in the costs associated with film and its processing, handling, and storage, improved operational efficiency and enhanced patient care within the hospital. The function of the PACS is to acquire, distribute, display and archive imaging data and related information used by the institution. This data will be incorporated into and stored in the PACS at the full contrast and spatial resolution originally obtained by the acquisition devices. Access to the data will be limited to the authorized person. The system shall be interfaced to HMIS to support display of HMIS diagnostic reports alongside medical images on user-friendly, high performance, applications-oriented workstations, and automated image management and distribution. The PACS image storage and management subsystem must allow the rules for image management to be determined by the customer.

Any future upgrade or integration with the other RIS-PACS system in the hospital should be possible. System should conform to latest DICOM and HL7 standards. It should be compatible with all the standard modalities, PACS and imaging entities currently in the hospital and also with those added in the future. The system should allow high speed transmission and viewing of data with adequate security measures against viruses, unauthorized access, and encryption to prevent misuse.

The proposed RIS-PACS solution should be compatible with multi-monitor setups (1 Text monitor with 2 or more Diagnostic Medical Grade Monitors connected to a single workstation).

The user should be able to report (type /dictate) and simultaneously interact with the DICOM images using a single mouse. The text and the image area should be in sync to minimize errors in reporting.

The user should be given visual indications when the image and reporting areas are out of sync.

Terms and Conditions for PACS solution-

1. The RIS-PACS application should be US FDA & CE certified (not more than 2 years old) and fully scalable RIS-PACS system.
2. The system should have USA IHE certification
3. The RIS-PACS vendor should have experience integrating the quoted solution to an HIS/ EHR solution for receiving orders and forming DMWL for modalities. The solution should also have an ability to provide/ share the radiology reports based on parameters.
4. In addition to the FDA certificate for RIS-PACS application, the vendor should offer viewer capable of displaying full fidelity DICOM images. The viewer must allow image access from

any device (computer, IPAD, Tab, etc.) using standard browsers e.g. Mozilla, Safari, Internet Explorer. ZEP should be FDA diagnostic approved.

5. Vendor to provide PACS IHE Integration Statement for the proposed solution with supported Integration profiles as part of the bid. Vendor should be member of USA IHE.
6. Vendor must offer VNA with XDS-I integration profiles for image archive along with PACS system. The vendor should offer associated hardware and software if required.
7. Unlimited licenses should be provided to the Hospital.
8. Non-DICOM data should be stored in native format only. Data format correction is not allowed.

System and Technical Requirements for PACS:

The below mentioned specifications of each component of hardware and software are the minimum required. However SI may quote an equivalent or advanced version that is commercially available or likely to be commercially available at the time of purchase. Further the compatibility of the quoted items with each other and with the existing system if any is an essential requirement.

The SI should take an overall responsibility of both the software and hardware components including all licenses for complete maintenance time of warranty.

It will be the responsibility of the vendor to demonstrate capabilities/functions quoted to the technical evaluation committee onsite if required.

71. Fully integrated RIS and PACS
72. To be integrated with existing PACS System of Medical College, Chandarpur for exchanging data/information/images.
73. Easily Deployable with simple web based interface.
74. Multimodality connectivity, advanced work list, image processing tools
75. Should provide connectivity to Non DICOM equipment.
76. Tele radiology module allowing access of images remotely with all tools using low internet bandwidth.
77. DICOM Film Print support
78. CD /DVD writing support with embedded DICOM viewer
79. Archiving Module
80. HIPAA & HL7 Compliant.
81. Minimum IHE profiles to be supported are

- a. Scheduled Workflow (SWF),
 - b. Patient Information Reconciliation (PIR),
 - c. Simple Image and Numeric Report (SINR),
 - d. Mammography Image (MAMMO),
 - e. Consistent Presentation of Images (CPI),
 - f. Key Image Note (KIN),
 - g. Evidence Documents (ED),
 - h. Portable Data for Imaging (PDI),
 - i. Access to Radiology Information (ARI),
 - j. Audit Trail and Node Authentication (ATNA),
 - k. Consistent Time (CT),
82. Advanced and Intelligent work list.
83. Stat reads highlighted and automatically takes priority.
84. Search criterion on various parameters like Patient ID, Name, Accession No, Date Hospital Name, Referring Physicians etc.
85. Compressed image support for faster downloads.
86. Prefect option to download priors automatically reducing waiting time for the radiologists.
87. Ability to load different studies, side by side for comparison.
88. PACS Solution should be Truly web based with all features like CD/DVD Writing, Film printing, Image viewer and Reporting module available through browser from any station. No installable software should be required to use these functions from any station.
89. It should be possible to import images from external CD/DVD directly into the system without any external software/workstation.
90. Report text search engine should be available
91. Should support DICOM MWL integration with all modalities
92. Roaming profile – user definable settings
93. Should be possible to edit the DICOM information of images
94. It should be possible to create a image library of interesting cases with keywords
95. It should support scanning of documents and attach as DICOM files
96. IT dashboard should be available.

RIS should have the following modules –

- DICOM MWL based integration with HIS

- Order Management
- Appointment scheduling
- Inventory Management
- HL7 support
- Email & SMS Support
- Document Scanning
- Pre-Vetting

Following Image Processing Tools should be available in the image viewer

- Window / Level – Manual or Presets.
- Image Scroll on Mouse.
- Pan and Zoom.
- Flip, Rotate, Invert.
- Crop – Elliptical, Rectangular or Freehand.
- Cross Reference Lines.
- Movie mode with speed control.
- Measurement: Linear, Angular, Cobbs Angle tool.
- Annotations like text, pointer, line etc.
- HU Value display – Point and average.
- Multi-frame image display support should be available
- Image display Matrix 1 x 1, 2 x 2, 3 x 3 etc.
- Series Display 1 x 1, 2 x 2, 3 x 3 etc.
- Image Linking – Interlink series for synchronized scrolling of images.
- Spine labelling tool – Automatically labels Vertebral Bodies or Disc space with just a mouse click.
- Magic Slice – Allows the radiologist to click on any part and see the corresponding slice.
- MIP, MPR, 3D, Volume Rendering tool is required for every Diagnostic user and it must be browser based. Volume render application should be from same PACS OEM.
- Curved Planar Reformats (CPR) tool is required for every Diagnostic user
- Automatic Image Registration and Fusion tool is required for every Diagnostic user
- Inbuilt chat module is required
- Image export to JPEG/BMP/TIFF formats
- Auto Edge detection on image
- Ability to create Key series/merge 2 studies/split a study

Following Hanging Protocols Tools should be available in the viewer

- Provide easy access to a gallery of prepared hanging protocols from which the user can choose
- Support the option to create hanging protocols by drag and drop actions
- Support the functions to have both user and system level hanging protocols
- Upon opening a study, provide the correct hanging protocol should immediately be used to display the images. This automatic selection should be based on:

- body parts
- modality Types
- procedure codes
- Allow to create a display workflow based on hanging protocols. Each hanging protocol can contain one or more presentation groups and the user shall be able to easily and intuitively navigate through all presentation groups that are part of the hanging protocol. It shall be possible to have the system automatically select a correct hanging protocol and/or presentation group based on body part, modality type or procedure code
- Support the functionality to have dedicated hanging protocols for comparison of studies
- Allow the user to Interactively change the layout:
 - viewport tiling
 - full screen layout
 - add/merge viewport
- Allow for dynamic hanging protocols where:
 - the renderer (3D, MIP/MPR, ...) can be changed in each viewport on the fly
 - viewports can be added on the fly
 - images can be added by drag and drop from the clinical sidebar
 - comparison with prior studies can be made
- Within the image area, provide a list of all studies for the active patient. This list should allow the user to select additional studies to display without the need for major mouse movements
- Support the creation and usage of Multi-modality hanging protocols
- Provide auto combine of series:
 - US single frame
 - CR/DX
 - RF

Following features should be available in the reporting module –

- Template based reporting and speech recognition support.
- Each radiologist can save their own templates.
- Ability to add Key images on the report
- Transcription Module – audio file capture and upload.
- Finalized Reports to be auto emailed.
- Images and reports can be viewed by referring physicians.

Following features should be available in the DICOM Film composer

- Film composer should support Standard and User definable film formats.
- DICOM Film print to multiple printers should be possible
- Should support all film sizes

- Customizable header and footer option should be available.
- All processing tools should be available before printing.

Following features should be available in the Admin Module

- User creation and modality connectivity settings.
- Different rights can be assigned to each user/ group.
- User Logs for Audit
- Rules can be configured to assign studies to a particular radiologist/ group depending user defined criteria.
- Management/ Statistical Reports like Radiologist TAT, Study volumes etc.

Following features should be available in the Radiology viewer

- Embedded 3D Viewer
- Embedded 3D Reconstruction
- Embedded MIP
- Embedded MPR
- Basic Measurements
 - spine labelling
 - cobb angle
 - Leg length difference
 - horizontal alignment
 - vertical alignment
- Embedded reporting with Embedded Speech Magic
- Patient-centric timeline view
- 3D Reconstruction should be from the same OEM who is offering the PACS

Following features should be available in the ZFP Diagnostic viewer

- FDA Approved for Diagnostic Reading
- Basic Measurements
 - Angle
 - Distance
 - Cobb Angle
- MIP
- MPR
- Multi Monitor Support
- Ability to see Images & Report

Following Licenses should be provided for the RIS-PACS –

- 1) Unlimited Modality connectivity including for MRI, CT, PET, SPECT, NM, X Ray, US, Tomosynthesis etc.
- 2) 15x User Licenses (Reception/Technologists, Transcriptionist)
- 3) 15x Diagnostic Reporting licenses
- 4) 15x Tele-radiology/Remote Viewing License
- 5) 15x MIP, MPR 3D, Volume Rendering, CPR, Image Registration & Fusion licenses
- 6) 30 ZFP Diagnostic Viewer Licenses
- 7) Unlimited Mobile/iPad/TAB viewing licenses
- 8) 15 licenses for viewing OT videos on PACS application/viewer which complies to XDS profile of IHE.

Hardware requirement for new PACS System-

- Configured in virtualized environment and with High Availability design
- The solution architecture should be database replicated using physical/virtual load balancer from F5/10. There should be no single point of failure for any H/W or S/W component. The Entire solution architecture should be distributed on 2 Blade chassis. The entire should have no impact even if one of the entire blade chassis has a complete failure. Details of the necessary HW for PACS Server and workstation is mentioned below

1. PACS Workstations-

All displays, graphic card and QA software should be of the same make. Swap displays to be provided in case of any repair and half yearly calibration to be performed. All diagnostic displays should have protective front cover.

All necessary certification FDA, CE and other as per ACR should be provided as applicable.

Bids should not have any deviation from the requested specification, else will be technically disqualified.

Installation list to be attached.

a) Radiology workstation for PACS including CT/MRI/X-RAYS (Make- As per approved make list)

Power supply, 16x DVDRW, USB optical mouse, CPU cooling kit, E5-1650v3 CPU, 16GB Mem, 128GB SSD	1
3/3/3 UK FIO	1
USB Standard Keyboard US International	1
Chassis Tagging service SN+MAC+UUID	1
Packaging Tag SN+MAC1+Mac2+UUID	1

Localization Kit UK FIO	1
Win8.1 Pro to Win7 PRO APJ FIO	1
Win8.1 Pro 64 bit OS APJ FIO	1
CP Workstation UC 3Y 4H O-S DMR	1
<p>1. Medical Grade 6MP Color Diagnostic display for PACS including X-ray/CT/MRI with graphic card and Medical QA & QC software – latest model should be quoted with the latest graphic card.</p> <ol style="list-style-type: none"> The display system should include the display, Graphic card and Medical QA software along with accessories of the same make. Should be based on the latest screen technology TFT AM Color LCD IPS .LED backlight and size of 30.4’’ or more with a resolution of Native 6MP (3280 x 2048) Luminance Maximum 1050cd/m² or more and DICOM calibrated at 600cd/m² with a contrast ratio of 1500:1. Power consumption 100W @ calibrated luminance of 600 cd/m² 64W @ calibrated luminance of 400 cd/m²Screen protection with a protective , non-reflective glass cover Should have necessary front sensor for automated calibration and image optimization features to improve uniformity. The display should have touch pad to support zoom and magnify of a spot. The display should have the feature to be connected to a projector through the graphic card in the same configuration. Warranty – 5 years for the entire system. Standby system should be provided in case of repair. Backlight warranty of 40000 hours @ 500cd/m² within the five years. Company/Distributor should have office and team in India for more than 10 years. Each diagnostic display should be combined with a 2MP clinical grade display of the same brand at least 20’’ or more for RIS and reporting and should have a DICOM calibrated luminance of 180cd/m² with front sensor and cleanable protective cover with 5 years warranty. The entire system should meet the ACR guidelines. Online QA services – Cloud based QA 	1

b) For Radiology workstation (CT/MRI) for PACS (Make- As per approved make list)

Power supply, 16x DVDRW, USB optical mouse, CPU cooling kit, E5-1650v3 CPU, 16GB Mem, 128GB SSD	1
3/3/3 UK FIO	1
USB Standard Keyboard US International	1
Chassis Tagging service SN+MAC+UUID	1
Packaging Tag SN+MAC1+Mac2+UUID	1
Localization Kit UK FIO	1
Win8.1 Pro to Win7 PRO APJ FIO	1
Win8.1 Pro 64 bit OS APJ FIO	1
CP Workstation UC 3Y 4H O-S DMR	1
<p>1. Medical Grade Diagnostic display for PACS /CT/MRI 4MP Fusion with graphic card. Touch pad and Medical QA & QC software –latest model should be quoted with the latest graphic card to support 4MP in a dual view/single and 2MP clinical display</p> <ol style="list-style-type: none"> a. The display system should include the display, Graphic card and Medical QA software along with accessories of the same make. b. Should be based on the latest screen technology IPS-TFT color LCD .LED backlight and size of 30.4’’ or more with a resolution of 4 MP Native 4MP (2560 x 1600) Configurable to 2 x 2MP+ (1280 X 1600) Configurable to 2 x 2MP (1200 X 1600) c. Luminance Maximum 1050cd/m² or more and DICOM calibrated at 600cd/m² with a contrast ratio of 1500:1. d. Power consumption 100W @ calibrated luminance of 600 cd/m² 64W @ calibrated luminance of 400 cd/m² e. Screen protection with a protective , non-reflective glass cover f. Should have necessary front sensor for automated calibration and image optimization features to improve uniformity g. The display should have the feature to be connected to a projector through the graphic card in the same configuration. h. Warranty – 5 years for the entire system. Standby system should be provided in case of repair. Backlight warranty of 40000 hours within the five years. i. Company should have direct office and team in India 	1

<p>for more than 10 years.</p> <p>j. Each diagnostic display should be combined with a 2MP clinical grade display 20inch or more of the same brand for RIS and reporting and should have a DICOM calibrated luminance of 180cd/m² with front sensor and cleanable protective cover with 5 years warranty</p> <p>k. The entire system should meet the ACR guidelines.</p> <p>l. Online QA services – Cloud based QA</p>	
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c) **Ultrasound Workstations for PACS- (Make- As per approved make list)**

Power supply, 16x DVDRW, USB optical mouse, CPU cooling kit, E5-1650v3 CPU, 16GB Mem, 128GB SSD	1
3/3/3 UK FIO	1
USB Standard Keyboard US International	1
Chassis Tagging service SN+MAC+UUID	1
Packaging Tag SN+MAC1+Mac2+UUID	1
Localization Kit UK FIO	1
Win8.1 Pro to Win7 PRO APJ FIO	1
Win8.1 Pro 64 bit OS APJ FIO	1
CP Workstation UC 3Y 4H O-S DMR	1
2MP Dual Head Clinical Grade Color Monitor (Barco or Equivalent) with following features <ul style="list-style-type: none"> • Maximum luminance: 440 cd/m² • DICOM calibrated luminance: 250cd/m² • Contrast ratio: 1500:1 • MediCalQAWeb • Response time 2ms • Ambient light compensation With front sensor	1

2. Software and Accessories for Speech Recognition-

Vendor to offer Nuance speech magic with 11 concurrent users and with 1:3 concurrency (Radiology Edition and Indian Accent support) and 15 MICS should be provided. UR should be incorporated in embedded mode using an SKD as per the requirement and complete in all respect and satisfaction of the engineer (with 5 years onsite maintenance support).

3. Film Digitizer with Software

Should support all film sizes
Should be FDA approved.

CCD Based Scanner
 16 bit DICOM Image Output
 DICOM Send to PACS
 50 micron scanning capability
 Workstation with Image Processing software & DICOM MWL support

4. Robotic CD/DVD Writer

Disc Capacity:	100 discs
Number of Drives:	2
Disc Recorders:	Latest-generation CD-R/DVD-R recordable drives; optional 12x BD-R drives
Recordable Formats:	CD: CD-R, CD-RW, CD-Audio (CD-DA), Video-CD, MP3 to CD-Audio, most other industry-standard CD formats DVD: DVD±R, DVD±RW, DVD±DL
Print Method:	Thermal inkjet
Print Resolution:	Up to 4800 dpi
Print Head:	Semi-permanent; user replaceable
Ink Cartridges:	Separate high-capacity ink cartridges for Cyan, Magenta, Yellow and Black (CMYK)
Colors:	16.7 million
Color Matching:	Color profile included
Robotics:	High-speed belt drive
Data Interface:	USB 2.0 for CD/DVD drives
Power:	Universal auto-switching 100-240VAC, 50/60 Hz, 5.0A
Certifications:	UL, UL-C, CE, FCC Class A, RoHS, WEEE

Library Management System (LMS)

Complete infrastructure to be provided for automation of the Library for institute with all the modern facilities etc.

Functional and Technical requirements.

Automation of Library Management system is to automate, manage and look after the overall processing of Library. Complete solution would be capable of managing Book Issue, Book returns, Magazine / Newspaper subscriptions, calculating / managing fines and generating various reports for Records, Book Inventory and theft detection. It also provides the self-check out/in.

Library Management system should efficiently manage libraries, provides the ease of use and convenience to the users as well as librarians. System should be RFID enabled technology based to cater all the requirements of the institute.

Salient features of the Library Management System:

1. Centralized database for student and staff
2. Books should be identified by unique id using RFID chip.
3. Each student and staff should be identifying by a unique RFID card
4. Manual and self-issue/return of book facility.
5. Report of all transactional details.
6. Theft Detection through RFID Gates.
7. Handheld Inventory device with audible and visual and also provide the missing Book records & stock taking.
8. Self-Check out/In with receipt.
9. Automatic calculation of the Fine and payment.
10. Application should be web based.
11. Other features as per the requirement of the college/institute
12. Technical specification of the system is mentioned in Annexure- D enclosed herewith.

System Integrator Information Technology firm/service provider should have experience for implementation of the RFID based Library Management system in large institution.

Completeness of the system

In addition to the above, any other functionality to be added & customized as per the requirements of the Medical College, Chandarpur. Integration with the other system like PACS, QMS, LMS (Library Management System), Guest House Management System, other HMIS, building management system (BMS), Drug Database, etc. shall be done as per the requirement of the Medical College, Chandarpur. No additional charges to be paid for integration from any of these or others like smart cards, wrist bands, digital pens or any other system required as per requirement of site and client.

HMIS should make the hospital work completely paperless.

SI should be responsible for making all necessary efforts/arrangements to provide high bandwidth internet connectivity from service provider.

SMS Gateway & e-mail server, gateway etc. to be provided by the SI without any extra charges till implementation & Go-Live of the project and 3 months after the Go-Live.

Integration with all the relevant Medical College, Chandarpur equipment & other instruments should be done as per the requirement.

3) Special Terms and conditions for development of IT infrastructure

- I. All the latest hardware and software should be provided with latest Technology, maximum up to six months old. Beyond that it will not be acceptable.

- II. Cost of the any additional hardware and software to be required for completeness of the system as per the hospital requirement to be covered in the present scope and Bill of Quantity. No additional charges to be paid for extra item.
- III. All the licenses of the software will be provided in the name of the client.
- IV. **Server Hardware and Software** - No. of servers, associated hardware & software and their specifications proposed by SI for HMIS Solution, PACS should meet the System and Technical requirements of the tender. In case during the implementation of HMIS, PACS if additional Server hardware, Software etc. (not quoted in the present BOQ) is required to meet these system and technical requirements (performance of the system, system uptime etc. as per the requirements) then SI should provide additional Hardware, Software etc. without any extra charges to meet the above requirements.
- V. **Training** - Training for all users as per the requirement of the hospital shall be provided by SI for HMIS, PACS, LMS, Web Portal, Mobile Apps & QMS Solution.

In case after completion of 1st session of training, if additional session is required for any existing user or new staffs joining the organization, then separate training program shall be organized without any extra charges. This is applicable for entire duration of the project or till completion of the project.

Kindly consider all above condition during submission of the bid.

VI. Approval of Materials

Technology (Hardware and Software) used on the Works shall be latest, new and of the best quality available, confirming to the relevant specifications and as per good Engineering practice. Prior approval shall be obtained in writing from the Engineer for all materials proposed and when necessary approved sample duly identified and labeled shall be deposited with the Engineer and shall be kept at site. List of approval make indicates make/manufacturer generally acceptable but final choice of make/manufacturer of material & models shall be with the engineer.

VII. Guarantee/Warranty and Onsite Maintenance Support:

Terms & Conditions:

- The project will be accepted when all the goods, components, software etc. of the project are supplied, successfully installed, tested and commissioned by the SI.
- A comprehensive warranty applicable on all Equipment/Software under this contract shall be provided for 3 (three) years from the date of acceptance of respective phase.
- The SI shall warrant that the Goods supplied under the Contract are new, non-refurbished, unused and recently manufactured; shall not be nearing end of sale / end

of support; and shall be supported by the SI and respective OEM along with service and spares to ensure its efficient and effective onsite maintenance for the entire duration of the contract. The manufacturer should also submit guarantee/warranty that it will keep the client informed of any up-date of the equipment over a period of 3 (three) years from the date of acceptance.

- The SI should ensure that the manufacturer will supply regularly any items or spare parts for satisfactory operation of the equipment during the period of Guarantee/warranty and maintenance period
- The SI hereby guarantee/warranty that the goods/stores/ articles supplied to the Purchaser under this contract shall be of the best quality and workmanship, strictly in accordance with the specifications and standards contained/mentioned in the tender and shall operate properly and safely. All recent design improvements in goods, unless provided otherwise in the Contract, shall also be made available. The purchaser will be entitled to reject the said goods/stores/ articles or such portion thereof as may be discovered not to conform to the said description and quality. The SI shall, if called upon to do so, replace goods/stores/articles within a period of fourteen days or such further period as may be extended from time to time by mutual discussion, on an application made thereof by the SI, the goods/stores/ articles or such portion thereof as rejected by the purchaser. In such an event, the penalty will be imposed as per penalty clause. On such rejection of goods/stores/articles will be at the SI's risks and all the provisions herein contained relating to rejection of goods, etc. shall apply. Otherwise the SI shall pay to the purchasers such damage as may arise by reason of breach of the conditions herein contained. Nothing herein contained shall prejudice any other right of the purchaser in that behalf. If the SI, having been notified, fails to remedy the defect(s) within the period so specifically specified by the Purchaser (keeping in view the urgency), or reasonable period as circumstances warrant but maximum of 45 days, the Purchaser may proceed to take such remedial action as may be necessary, at the SI's risk and expense and without prejudice to any other rights which the Purchaser may have against the SI under the Contract.
- The SI further warrants that the Goods supplied under this Contract shall be free from all encumbrances and defects/faults arising from design, material, manufacture or workmanship (except insofar as the design or material is required by the

Purchaser's Specifications) or from any act or omission of the SI, that may develop during intended normal use of the supplied Goods in the conditions prevailing at the respective client Locations.

- The Purchaser shall notify the SI in writing of any claims arising under the warranty as per terms of Purchase Order from time to time as applicable.
- SI should categorically confirm that they will give "After sales services" during guarantee/ warranty period from the date of installation, satisfactory commissioning, acceptance and handing over of the respective phase of project. The firm must ensure that they will provide every calendar year, at least 4 number of preventive maintenance to all of the equipment and also any number of emergency visits during each year of Warranty/Guarantee and maintenance period. Preventive maintenance has to be done in consultation with client team.
- During the guarantee/warranty period and maintenance period the firm will be required to maintain the Hardware, Local Area Networking, Security Solution, UPS and other equipment/product supplied under this tender in good working condition so as to ensure fault free operation of the system for 24 hours on all the days of the year including holidays and Sundays.
- During the guarantee/ warranty and maintenance Period, the SI shall cover all the items and spares including batteries of UPS, Printer Heads of DMP and Band of Line Printers, Fuser assemblies of laser printer.
- Consumables items i.e. Printer Ribbon, Stationery, Toner cartridge, Tape Cartridge, Floppy, CD and DVD only are not covered under Guarantee/Warranty and maintenance period.
- The SI should also ensure that the batteries of all the UPS supplied are of specified rating in terms of Quality & Performance in good working order (i.e. backup time as per specifications) during the period of Guarantee/Warranty and maintenance. In case the batteries are faulty or backup time reduced due to any reason the SI has to replace the batteries free of cost during the period of Guarantee/Warranty and maintenance.
- The SI should certify that they have fully trained technical staff for installation/ commissioning/testing/maintenance during the entire period of Guarantee/Warranty and maintenance period. Any damage caused by IT agency/SI's maintenance and

technical support engineers, shall be made good by SI at their own cost within a reasonable time frame to be mutually decided by the client and SI.

- The engineers deputed should be able to handle problems related to their respective areas.
 - The SI has to maintain adequate spares and inventory for client to ensure fault free operation of the system as per the required up time during the guarantee/warranty and maintenance period.
 - The entire equipment/products are classified in four categories: i.e. **Category-A, Category-B, Category-C**
 - Any type of software or accessories required to make the system operational in the Category-A or Category-B or Category-C items are also part of respective Category.
 - **Uptime during Warranty/Guarantee and maintenance Period**
 - For Category -A items – minimum 99.8% uptime to be calculated on quarterly basis.
 - For Category -B items – minimum 99% uptime to be calculated on quarterly basis.
 - For Category -C items – minimum 97% uptime to be calculated on quarterly basis for Equipment(s).
 - Downtime is calculated on the basis of following
 - Total Downtime (%) = $\frac{\text{Downtime}}{\text{(Total time – Maintenance time)}} \times 100$
- 25..1. Uptime (%) = 100 - Total Downtime (%)
- 25..2. Total Time (hour) = Number of Days in quarter * 24
- Downtime, Total Time & Maintenance time will be rounded off to hours. The Time >= 30 minutes will be counted as one hour.
 - Downtime refers to a period of time span that a Equipment(s)/Service(s) is not functioning due to a result of some failure in the system.
 - Maintenance time is time span resulted from planned maintenance, carried out with written permission of client.
- For end-to-end availability of all the buildings, the SI has to ensure that all the components are working. If due to failure of any component the not available for use, then downtime will be considered as per Category-A.

- No deduction of any kind on account of Sundays, half days on Saturdays, Public/Govt. holidays observed by the client shall be allowed from the total downtime permissible as defined.
- Maintenance of during guarantee/Warranty & maintenance shall also include customized Update & upgrades of software patches, Removal of Bugs & Fine tuning. The Updates and upgrades of other software supplied in the project should also be provided free of cost during the period of guarantee/Warranty & maintenance.
- Maintenance of the HMIS – Application software after the expiry of the maintenance period on agreed terms
- The responsibility of the SI shall not come to an end on the termination of the period of contract and the SI shall maintain /ensure that various components shall function even after the expiry of the period of agreement.

Any bug/error arising in the HMIS, PACS & QMS applications should be resolved within 2 hours and any customization/change to be done in the application should be made within two days of its written requirement/demand raised by client.

Penalty Clauses

- **Penalty During warranty period and maintenance period.**

For the purpose of Downtime calculation and Penalty the followings three categories are defined on the basis of Services/Equipment(s).

S No.	Devices	Category
1	Wi-fi controller, server, Firewall	A
2	Access Point, Access Switches	B
3	I/O points, Client Computers, other Passive Components, NMS software and remaining devices	C

- If due to failure of any equipment(s) or service(s) any other Equipment (s)/Service(s) are down or affected, then penalty will be imposed for services/equipment having higher uptime requirement.

- If some Equipment(s)/Service(s) or part of it is down but the Equipment(s)/Service(s) is working due to redundancy features of the Equipment (s)/Service(s) then down time of that particular Equipment(s)/Service(s) will be considered.
- The Table below shows the calculation for down time on quarterly basis.

Category	Minimum Uptime (%)	Total Hours	Leverage Hours per quarter
A	99.5	2190	4
B	99.0	2190	22
C	98.0	2190	66

- The leverage hours of quarter would lapse in the respective quarter and shall not be carried forward to the next quarter. The Penalty, measurable on quarterly basis, would be enforceable for degradation/deviation from the committed performance level as per the following table

Category	Minimum Uptime (%)	Downtime Penalty per hour
A	99.5	Rs. 10,000/-
B	99.0	Rs. 5,000/-
C	98.0	Rs. 3,000/-

For the application (HMIS, PACS, QMS etc.) downtime & its late response in the customization, penalty at the rate of Rs 10000/- per day will be levied.

- **Penalty on the account of Facility Management**

Service	Target (A)	Penalty for NOT meeting target
System Administration & Management, Network Administration & Management, Security Administration & Management and Management, Upgrades and Updates	Immediate	In case of failure of any services the penalty will be as per the Category-A/B/C in which the effected services falls

All the services shall be provided by the SI during the period of implementation and thereafter for a further period of 1 (one) year after successful installation. For this purpose, adequate manpower should be deputed. During the period of maintenance & Warranty, SI should depute adequate manpower – capable of trouble shooting, rectifying the problems and maintaining the solution at client.

SI should provide various services namely

- i. System Administration and Management
- ii. Network Administration and Management
- iii. Security Administration and Management
- iv. HIS – Application Software Administration & Management
- v. User Support and Management

for a period of one year. Adequate manpower is to be deputed for following services:

System Administration and Management

- a. Administration and management of all Servers including Database, Application, Web, Mail, Proxy, NMS, Antivirus etc., along with other devices implemented by the SI. Troubleshooting and fine-tuning the servers, their Operating System, RDBMS, SAN Devices along with other components, as described above, as and when required.
- b. Management, Review and Documentation of Admin users and User Data Access policies.
- c. Management of various Clusters.
- d. Database Administration
- e. Management of Regular Data Backup & Retrieval of Data. Updation of Data Backup and Retrieval policy, as per requirement, and Documentation of the reviewed policy

Network Management and Security Administration

- a. Management and Administration of Local Area Network (LAN) and Wide Area Network (WAN). The Components to be managed include networking components as supplied by the SI for this project.
- b. The SI will manage and review the defined Virtual Networks as and when required by client. Reviews in **Defining of virtual Network** needs to be documented.

Security Administration and Management

- a. The SI will review the defined Security policy, from time to time, to make the system safe from internal and external threats. Every reviewed policy needs to be properly documented by the SI.
- b. Troubleshooting, Fine-tuning & Management of the Network.

HMIS - Application Software Administration and Management

- a. Management, Review & documentation of the User Access Policies for the use of HMIS – Application Software on LAN and WAN
- b. Management, Troubleshooting and fine-tuning the HMIS - Application Software, as and when required.
- c. Implementation of HMIS- Application Software updates and upgrades, during the period of Warranty and maintenance. Documentation with respect to every update and upgrade implemented.

User Support and Management

Help Desk Services

- a. The SI has to maintain Dedicated Centralized Help Desk Service for end users, to solve the problems related to IT Infrastructure setup under the scope of this contract.
- b. Help desk services should act as a single point of contact, to solve day-to-day problems of end users.
- c. The help desk should be capable of solving the problem by firstly providing telephonic support, and if the problem persists then by deputing technically qualified personnel for the remedy.
- d. The SI would prepare an escalation matrix in consultation with the IT team of the client/HSCC for the different categories of call.
- e. Help Desk's responsibility is to generate certain reports to track following:
 - i. Call Analysis
 - ii. Call Trend
 - iii. Call History Report
 - iv. Daily call completed and pending Reports along with reason for not completion

- f. The deliverables and the activities of the helpdesk service, related to IT infrastructure of client, would also include the following.
 - i. Log user calls and give them a call ID number
 - ii. Assign severity level to each call
 - iii. Track each call to resolution
 - iv. Escalate the call to the relevant team like User support, System Administration, Network administration, HMIS application support etc. which is capable of resolving the issue and keep the IT team of the CLIENT/HSCC informed suitably.
 - v. Analyse the call statistics.
- g. The selected SI will have to arrange its own hardware and software tools, if any needed, to run the help desk facilities.

End users Workstation Management

- a. Installation and Configuration of HMIS – Application Software in each of end user Client, as and when desired
- b. Software Distribution
- c. License Control

End user Problem solving:

- a. The SI has to depute adequate team for facility management.
- b. The SI has to maintain Help Desk services (24 X 7 X 365) in the client for attending the Breakdown calls with respect to IT infrastructure supplied/installed under the scope of the Project.
- c. In case telephonic solution to the call doesn't solve the problem/complaint, the call of HMIS user (Clinical Area) has to be attended within 30 minutes whereas all other calls of HMIS have to be attended within 1 hour.
- d. In case telephonic solution to the call doesn't solve the problem/complaint, the Services related to any breakdown call or non-functioning call from end users of Internet/ E-mail has to be attended within 2 hours.

Others

- a. The SI has also to configure desktops in this facility management.
- b. Number of manpower of different skill set required for the facility management is to be indicated clearly for each shift on working day and on Holiday/Sunday.
- c. Vendor and Service Management by the SI
 - i. Periodic review of the System
 - ii. Evolution and recommendation
 - iii. Reports and Statistics

Escalation Matrix

A suitable escalation matrix should also be incorporated based on the SLAs defined for each individual task within the entire process, according to the following parameters:

- a. Importance/Urgency of the process defined
- b. Time frame defined at the stage of the process
- c. Level of escalation

It is envisaged that while designing the new automated processes as described above, the responsibility centers (for internal employees based on designation and roles / responsibilities assigned) as well as approximate time duration to carry out the tasks, and eventually to complete the entire process, will be clearly defined in the system. These will be used as inputs to display required information to the personal Dashboards of individual Users, and also used for auto escalations to seniors in case of inactivity by any staff without valid reason.

A fully automated HMIS process requires 3 steps from start to finish, with responsibility centre as 3 different Users namely User1, User 2 and User 3 respectively. In this case, if the User 1 logs into the system, he will see one task pending on his personal Dashboard, which he can click to see other details of the task. If however, at the first step the User 1 who is the responsibility centre to complete that step, and if he doesn't perform this task in stipulated 1 day, it will be automatically escalated to Senior User, who can then take necessary remedial action. Similarly, it will be for other 2 steps also. The Senior User may be same for all steps or different, as the case maybe.

Each automated process in the HMIS system is envisaged to have this feature, so that the Dashboard feeds for individual internal users can be derived by the system and displayed accordingly. Similarly all the Red Flags' or "Escalations" can also be displayed.

Note: The Implementation Agency is required to analyse the re-engineering components in order to adequately build this functionality in all the processes of HMIS. It is also a mandatory requirement

that all the processes should be interlinked to share data / information, and also to 'Admin' module so that access rights and content can be dynamically controlled as and when required by client/HSCC themselves.

LAN & Wi-Fi

Network Infrastructure

Establishment of Local Area Network (LAN), Wide Area Network (WAN) and Wi-Fi system at Medical College, Chandarpur

Introduction

At its Medical College, Chandarpur, client wishes to setup a State-of-the-Art, high performance, fault-tolerant, secure and highly available IT Networking infrastructure and shall utilize the best of products and latest, open standards based technology, high quality services and workmanship.

Scope of work

1. The entire Local Area Network shall be established on 10 Gigabit connectivity.
2. Cable (U/FTP Cat 6A & Optical Fibre Cable) based network shall be established in the Medical College, Chandarpur for the following blocks:
 - a. Hospital Block – 650 Bedded.
 - b. Medical College.
 - c. Medical College – Lab & Offices (Medical Lab).
 - d. Library.
 - e. Admin Block – IMA Office.
3. In addition to the cable based network, secured wireless network shall also be established for the above mentioned block.
4. Supply, Installation, Configuration, Testing and Maintenance for the followings:
 - Core switch, Distribution Switch & Access switches
 - Network Management Solution (NMS)
 - Wireless Access Point (indoor)
 - Wireless Controller
 - FirewallAll the necessary licenses for the above equipment to be provided as per the requirements.
5. All products of network i.e. Network Switches, Wireless devices and Firewall shall be offered with 3 years OEM warranty and 24/7 support with response time within 4 hours & same day rectification (replacement of hardware)

Establishment of Server Room

All the related works to make Server Room operational covered under the scope of work i.e.:

1. Flooring
2. Cooling - AC
3. Cabling (Network Connectivity)

4. Electrical Work
5. Connectivity with UPS
6. Furniture as per the requirement
7. Any other related work for the completeness of the work.

SI is required to execute all above work as per the requirement to make the Server room functional. Cost is to be included in the tender.

Data Centre

Data Centre (DC) for HMIS, PACS, QMS, or any other application shall be provisioned as a service by the SI. The centralized compute infrastructure should be able to accommodate any scaling up requirements necessitated in future. The following are the suggested/desirable features for the HMIS, PACS & QMS core database to provide optimum performance and scalability on demand and facilitate quick data response:

1. High Availability
2. Scalability
3. Data Security
4. Automatic Workload Management
5. Access Control
6. High Performance

The Implementation Agency should assess, design and deploy the components in identified Data Centre either in the ACTIVE-ACTIVE or ACTIVE-PASSIVE mode in order to meet the project requirements and SLA. The Implementation Agency should deploy and host the application in the “Data Centre” for the purpose of backup also. The Implementation Agency in mutual consultations with the HSCC/Client shall identify and ensure that required data is backed up at the DC.

Requirements:

1. The Implementation Agency shall build the compute infrastructure using the components including compute, storage, operating systems, firewall, IPS, Load balancer and backup services. All these components should be provided including the monitoring, management and support with 99.5% SLA. The Implementation Agency should choose the components with required quantity to build the optimum infrastructure required to meet the application availability and performance SLA to HSCC/Client.
2. The Implementation Agency shall supply, install, configure and manage the antivirus solution hosted at DC meant for the client infrastructure including desktops and servers, outside the DC.
3. System Operations & Maintenance Services - Undertake all operations and maintenance

services of all the components being procured and installed by Implementation Agency, to ensure that overall uptime commitment of 99.5%.

4. Backup / Restore Services — Ensure the back and restore of application and database using the services.
5. Application and Database support services - Provide administration, patches upgrade and update management services for Application and Database at DC.
6. The Implementation Agency must state the capacity that will be required for each of the application and what tools and techniques will be required to continuously monitor application performance.

There shall be no compromise with respect to the functionality and performance expected of each of the above components and appropriate care has to be exercised, while finalizing the device/component specifications and drawing up the final BOM, about scalability, security, performance, availability and manageability. One more factor to be taken care of here would be the compatibility of all these components with each other and with respect to the overall solution deployment.

The sizing should be carried out keeping in mind the peak load requirements, during which, a rapid growth in the transaction volumes occurs. Infrastructure should be pooled together, optimally utilized and enabled in virtualization mode so that benefits such as agility, dynamic and elastic resource allocation can be implemented.

All the applications should be enabled in virtualization mode making planning in such a way that peak resource requirements of different applications fall at different times so that resources of applications with lean requirements can be diverted elastically to applications whose peak time has occurred.

The scope of work of the SI for Network Infrastructure development shall also include, but not limited to the following:

1. Design, configure, testing at works, packaging, transportation, supply, handling at site, installation, laying, erection, testing, integration, training, acceptance test, commissioning of communication networks, as applicable along with associated equipment, hardware, software on a turnkey basis, inclusive of 3 years OEM warranty for maintenance.
2. Necessary cables including power cable and accessories as may be required for smooth and reliable operation of networking equipment.
3. The SI shall furnish complete details of acceptance tests proposed to be conducted before handing over the installation to the Medical College, Chandarpur.
4. Racks for mounting of network equipment including dressing of cables with proper marking in the rack.

5. All pipes & cable laying including termination, accessories including HDPE pipes, PVC conduits/channels, supporting structures, clamps, identification tags, ferules etc. required for laying of cables.
6. All cable laying including Fibre Optics cables inside and outside the buildings including excavation work required for laying of cables, conduit etc. Laying and installation of the cable should be as per the standard of industry norms.
7. Supply of all spares required during erection, testing, commissioning and warranty maintenance.
8. Minor civil works (if required) such as chipping/ cutting of floors for making grooves, making holes/ opening through walls, ceiling or floors, drilling of holes through steel structures and frames, grouting of frames, hooks on walls/ceiling etc. required for execution of work. After erection, surface shall be made good by plastering/painting to their original shape and finish.
9. Necessary Training for IT staff of the HSCC and Medical College, Chandarpur as per the requirements.
10. SI shall provide onsite maintenance support for the complete hardware, software & cabling system of the proposed networking system for period of 3 years after handing over to the Client. However, technically qualified & experienced engineers having good knowledge of Networking on regular basis to be posted at site for the period of 1 year after handing over to the Client. Deputed engineers should have experience in the Networking and should have technical qualification in the relevant field. Site engineer will co-ordinate with the authorized person of the Medical College, Chandarpur at site for all works including installation, commissioning and maintenance. The site engineer deputed from the service provider for maintenance support should attain the breakdown call and make all efforts to rectify faults related to failure of hardware/software/network at site with minimum possible time and maximum up to 24 hours from the time of reporting of fault.
11. SI shall arrange for posting of required technical staffs during erection, testing and commissioning and maintenance of the system.
12. Approx. 1800 Network points shall be required for the Medical College, Chandarpur through LAN connectivity.
13. Site certification is to be done by the agency for Penta-scanning and certificate to be submitted for the performance warranty of 25 years.
14. OLTS test is to be done by the agency for FOC connectivity as per the requirement.
15. No. of Indoor/outdoor wireless units shall be installed to cover all the area of the Medical College, Chandarpur as per the requirements depending on the physical layout and capacity of the wireless units for establishing wireless connectivity.

16. Completeness

Any equipment, materials or supplies which may not be specifically mentioned, but are necessary for carrying out the contract work shall be in the scope of the service provider and the system must be complete in all respect.

Additional specific terms of the contract for establishment of Local Area Network (LAN) and Wi-Fi System:

1. SI should provide tender specific authorizations from their respective OEM's for Active and Passive items. The OEM's shall also undertake to provide support commitments during the 3 years warranty period and also take all warranty related responsibilities in the event.
2. All products for network shall be offered with 3 years OEM warranty.
3. Licensing – All the licenses of the software will be provided in the name of the client (Medical College, Chandarpur)
4. SI sole responsible for all the maintenance with OEM Warranty of all the items supplied and installed for the period of 3 years from the date of commissioning and handing over of all the items to Client.
5. After award of work and at the time of implementation, in case the quoted model(s) are out-dated and new upgraded model introduce in the market then service provider shall supply the latest upgraded model without any extra charges. All the latest product and technology to be used at the time of establishment of the LAN and Wi-Fi System at site. Any product and technology should not be more than six months old.
6. If any promotional scheme is launched by the manufacturer at the time of supply of the item, all the benefits of the scheme will be given to the client/consignee.
7. SI has to provide the plan, design and site preparation as per requirement and as directed to the satisfaction of engineer and as per terms of the technical specifications.
8. A detailed shop drawings, concept drawing, indicating line diagram, route diagram showing details of laying underground, overhead or under wall cables showing details of cable, switches, joint etc. complete in all respect to be submitted to engineer for approval before ordering any items & start of execution work within 15 days of award of work. The design if required will be revised as per direction of engineer before approval.
9. SI is responsible for all unpacking, assembling, wiring, installation, cabling between equipment and components and connection to power supplies. They will test all Systems operations and perform all the necessary setup, configuration and customization for successful operation of the Network at site.
10. The Local Area Network (LAN) will be accepted only when authorized person from the Medical College, Chandarpur / HSCC has given satisfactory performance report of the installation.
11. LAN will be used for running Hospital Management and Information System, PACS (Picture Archival and Communication System), Internet and network facility and any other application as per the requirement of the Medical College, Chandarpur.

12. The entire infrastructure to be developed for providing above facilities with adequate speed and security as per the requirement.
13. Inspection – The inspection shall be carried out by authorized representative of HSCC.
Client/Purchaser have the right to inspect and/or to test the material to confirm their conformity with the contract and in case any inspected/tested goods fail to perform to the specifications, the client may reject them and the supplier shall either replace the rejected goods or make alteration necessary to meet the specifications free of cost to the Client/purchaser.
14. SI should provide the standard technical literature (not photocopies) of the entire offered product.
15. LAN should be at least 10 Gigabit Ethernet on Optical fiber backbone. SI may propose a high performance system which is capable to handle the needs of Medical College, Chandarpur.
16. The SI shall supply all the installation material/ accessories/ consumables (e.g. screws, clamps, fasteners, ties anchors, supports, grounding strips, wires, fiber connection kits etc.) necessary for the installation of the systems.
17. The SI shall be responsible for providing proper "Electrical ground" at all the required points as per the approved IEEE standards for Grounding of Sensitive Electronic Equipment and as per the OEM guidelines.
18. The SI shall install, wire the UPS power at required locations and provide proper electrical ground for the same before installation of the equipment. Civil works if any required for installation of the system will be the responsibility of the SI.
19. All the work shall be done in a conscientious manner as per the OEM guidelines and best industry practices. The system shall be subjected to inspection at various stages. The SI shall follow all Safety Regulations and practices.
20. The SI shall configure quality of service parameters on network switching devices for end-to-end QoS for critical traffic over the network.
21. SI shall be responsible for integration of security components in the network to ensure a secured network access for users.
22. SI shall configure network management policies for managing all the network and security devices using network management systems.
23. SI shall prepare detailed acceptance testing plan (ATP) for each of the components i.e. Network (LAN & Wi-Fi system) and submit the same to Medical College, Chandarpur.
24. All the functionality, features and configuration shall be documented for all the equipment/components and shall be demonstrated with respect to the documentation prepared.
25. The SI shall be responsible for obtaining approvals (if any) for any Statutory & Regulatory requirements from any of the authorities.
26. SI shall use his own sets of tools, tackles, etc. required for erection, testing, commissioning and warrantee maintenance of the system.
27. The entire internal Conduit has been already done at site with civil work during the construction stage according to the requirement if any modification need during cabling it is to be done by the SI without any extra cost.

28. Compliance for all the Network components (LAN & Wi-Fi) to be submitted along with technical bid as per the format enclosed at Annexure –C
29. Network up time should be continuous throughout the warranty period covering 24x7 without fail and as per the requirement of the hospital.

Other terms & conditions and requirements:

1. The network infrastructure and hardware & system software set up should be able to integrate with various software and system already running at Medical College, Chandarpur.
2. The system should be capable of handling the HMIS, PACS, QMS and other application as per the requirement of the Client.
3. The system should be compatible in all respects with current network infrastructure of Medical College, Chandarpur.
4. The network set up should be capable of providing high bandwidth internet/network connectivity in all the desktops, laptops, tablets or any other device as per the requirement.
5. The Wi-Fi should connect with all the devices i.e. desktops, laptops, tablets etc. and offer high bandwidth connectivity.
6. The desktops & other hardware systems should be able to run all the software including HMIS, PACS, MS Office, firewall etc. as per the requirement.
7. The system should be capable of deploying all the policies (i.e. Network, Security, etc.) as per the requirement of Medical College, Chandarpur.
8. The SI shall bear for any damage occurring during supply, installation, testing, commissioning & activation of network components, computer hardware etc. The same has to be rectified by agency at their own cost. In case agency fails to do rectification, the same shall be rectified by HSCC/client and involved cost will be recovered from the agency.
9. In case of additional hardware, software or any other work is required for completeness of the system, the same shall be provided by SI without any extra charges.

Other terms & Conditions for maintenance period:

1. During the Maintenance period, if SI fails to deliver the services required for maintenance & manpower support at any point of time, the same shall be done through other agency without giving any notice to the SI and the cost involved will be recovered from the SI.

Business Continuity

Implementation Agency shall design the Business Continuity solution. System should be designed to remove all single point failures. Appropriate redundancy shall be built to all critical components to provide the ability to recover from failures. Any components in addition shall be provided by the Implementation Agency and cost for the same shall be included in the price bid.

Implementation Agency is also expected to detail out in its technical proposal and provide a comprehensive BCP solution for all the entities.

Queue Management System

Queue Management System

Background

The number of seriously ill patients admitted to the hospitals has increased steadily over the years. Overcrowding of Out Patient Department (OPDs) and the wards is now a common scenario. This can largely be attributed to the number of the patients receiving care, healthcare professionals providing that care, and often people visiting the patients. Overcrowding may affect patient's symptoms, clinical outcome and satisfaction levels. It can also affect physician's effectiveness and lead to frustration and sometimes violence.

The Problem needs urgent redressal lest public may not rely on the quality of the care provided by the hospitals. The OPD in any hospital is considered as the mirror of the hospitals which reflects the functionality being first point of contact between the patient and the hospital staff.

As such, providing best OPD services are one of the primacies of the hospital. This can, to a great extent, be overcome by using IT, leading to enhanced productivity and reduction in waiting time. Queue Management system can be deployed in OPD and other services to streamline the patient flow in the hospitals.

The System

Queue Management System essentially comprises of Token Dispenser Unit with touch screen, Master Display (LED TVs), Computer desktops (each with a different client operator software) installed at the registration counter connected through LAN, Counter Display, and Server with Manager Console server software.

The location of these would, however, depend upon the current OPD setup in a hospital. The visiting patients could be categorised as – General, Ladies, Hospital Staff, Senior Citizens/Handicap.

Complete infrastructure for Queue Management System for all the OPD and Doctor/Consultant's room in the entire hospital to be provided and this is to be linked with the Hospital Management Information System through Appointment module. All the customization and integration shall be done in the Application Software of the QMS as per the requirement of the Hospital.

Functional and Technical Requirements

QMS should also have detailed functionality like QMS working model (Centralized, Decentralized or Hybrid), Web based/Web enabled, Level of integration with HMIS, functioning logic (i.e. the queue generated is invisible queue, visible queue, virtual queue or otherwise) along with their configurability features. It should also have process to issue Web based Tokens through QMS to support Registration & Appointment using HMIS along with Built in Redundancy (Hardware & Software), Upgradability & integration with SMS

Gateway. Number of areas to be covered should include MS Office, DMS Office (building wise), Registration Counters, Lab Counters, Consultant Rooms, Waiting area etc.

QMS should also have facility to display Counter Nos. & their respective Queue Nos. along with expected waiting time for each patient, define priority, define patient distribution logic, facilitate queue enquiry.

Queue Management System shall be required for the OPD for waiting of the patient at OPD area and further required in each Consultant's room for waiting of the doctor/consultant in the hospital.

Technology should be latest for all the equipment.

QMS shall also be linked with the OPD appointment module of the HMIS to cater all the patients who have already taken the appointment (online through web-portal etc.) for a particular consultant and visit to the OPD. QMS system will be used for both visiting patients and those who have taken the prior appointment.

Technical Requirements:

Intelligent QMS on Patient Solution

- **Patient should get approximate wait time**
- **Decongest Waiting Area**
- **Prepare for the consult by using Patient Engagement Solution**
- **Use the time to learn about patient condition**

PART 1 – GENERAL

1. QMS architecture should be planned in such a way that queues in various departments are managed with single token per patient maintaining its uniqueness per day.
2. Name of patients should be displayed in the TVs and LCD display units outside consultant rooms and individual registration/reception counters & helpdesk etc.
3. Queue should be managed for new walk-in patients, patients with online appointments & follow-up patients.
4. The QMS system **covers services including Pharmacy, Laboratory & Radiology services (such as blood test, X-ray, ECG, CT, MRI testing etc.)** with same token number assigned during entry/appointment of the patient.
5. Managing the queues so that queues in different departments are automatically prioritized depending on load on other departments.
6. Token dispensers should have capability of connecting with LAN as well as Wi-Fi of the Medical College, Chandarpur.

WORK DESCRIPTION

This specification covers the 'General Requirements' for the design, manufacture, supply performance, inspection, testing and commissioning including supply Queue management System.

Specific requirements shall be in accordance with single line diagram/specification & BOQ.

1. SYSTEM ARCHITECTURE

The system shall integrate the entire Queue-Token system at the **Hospital Departments** through the Hospital's intranet. It shall provide all elements in a suitable configuration to be connected to the Hospital's LAN via the structured cabling (by others). The basic under floor network points shall be provided. However, any additional network point if deemed necessary shall be provided by contractor. All additional cabling shall be strictly adhered to Hospital IT identical standards. The system should be scalable to support current and future operations.

1.1 All computers and workstations shall be interconnected using 10/100/1000BaseT using TCP/IP configuration.

- a. All Queuing Display Board shall contain full decoding equipment for their displays and shall be connected to the system using 10/100/1000BaseT using TCP/IP via RJ45 connection to the structured cable system.
- b. All registration counter and Dr. Room shall be browser based interface to the server system using the Cat 6 A structured cable network.

1.2 All Self appointment ticketing machines shall be linked to the system using 10/100/1000 BaseT using TCP/IP via RJ45 connection to the structured cable system.

- a. At each department, one multimedia display PC shall be designated to display queue information on TV and share hospital info to patient. In addition, the multimedia PC supported by relational database to keep all the records and system configurations for that department. The main advantage of this architecture is that the operation of patient flow shall not be affected by external factors such as network link breakdown with other department or main DB-Server or even shut down of Web-Server / Application Server. All browser calling terminal, Display, Hardware keypad and Ticketing machine (Kiosk) shall be communicating with multimedia PC through its LAN with TCP/IP with Department Hub.

2. QMS APPLICATION & SERVER

The main QMS Web application, QMS Appointment application, Database app & QMS Backup application shall be installed at proposed server room.

- A. The **QMS Web application & server** shall manage the QMS reporting for all the

departments. The Web app shall be supported by SQL database engine to maintain the QMS records. The database records shall be synchronized with the multimedia PC through scheduled background processes. It shall be handling the entire interface Applications data transfer to 3rd Party systems for data / patient record match.

- B. The **QMS Appointment application & Server** shall be designed to allow staff to allocate the necessary patient slots to be opened to public for medical appointment Booking. This appointment server shall be open to the public internet for public Booking. It shall be designed to pre-alert patients of their up-coming appointments.

It shall also design to alert patients for their turn to consultation room.

- C. The **QMS DB Server** shall have all the staff particulars and rights for them to Access the necessary modules within the Web-Server. There also need to have Database backup from the entire department Queue-Token Servers to this server periodically for data backup efficiency.

- D. The **QMS Backup Server** shall use in fail of QMS Web or Appointment or DB Server.

QMS Web Application & Server

1. The web-based software shall be installed in the Web Server (HTTP Server) mainly to support the QMS reporting and database management of all users accounts and authentication. The main functions are as follows:
 - A. The Web server is to provide Queue-Token information and to restrict access to Queue-Token information. The HTTP shall govern the rules of communications between QMS multimedia PC, and to handle lots of different types of data on different computers to achieve a browser based community.
 - B. The software to build the Web server shall be either IIS or Apache service.
 - C. A user-friendly web-based interface shall be designed for QMS administrator to manage the QMS configuration, Multimedia display and reporting.
2. The system must allow flexibility of changing system parameters, services type and configuration “**as and when**” needed.
3. The system **MUST** be able to handle a least 20000 transactions per day.
4. The system shall have load-levelling capability. The load levelling facility shall be user-definable such that at any point in time, the System Administrator should be able to distribute the Queue-Token load if a particular service is being over-loaded.
5. At any time during the Queue-Token-cycle, there should not be any duplication of numbers being appeared at the same time at two different counters.
6. Security measures shall be provided so that only authorised users shall have access to the system. Different access levels are also to be provided for different types of users so that each type of user can only have access to the functions and information that are relevant and necessary to perform their roles and responsibilities.

7. There should be an Online Administrative Panel (Software) for monitoring the Queue-Token-Flow / Workload for the all the departments and also to perform key-changes to the Queue-Token-Token-Flow / Workload from anywhere in the Hospital Department building intranet with different levels of Security rights for accessing the Panel.
8. The Administrator must be able to monitor the Queue-Token status ONLINE at any location that he / she is located by logging-on to the Administrator's Panel. The System Should allow him / her to make changes to the Queue-Token-flow, open / close Counters, linking of services and any change performed by the Administrator must be Immediately updated to the System real time.
9. The system shall have the capability to detect any system fault or breakdown and Informs the Administrator of the fault. Any malfunction of the system in one Operation section or hardware fault at any of the peripheral equipment should not Adversely affect the functioning of the system in other operational sections or lead to a total system failure.
10. The Queue-Token software shall be customised according to the Hospital's operational requirement.
11. The system shall have the facility to enable real-time monitoring and tracking of Waiting time and service time status.
12. The system must allow flexibility of enhancing multiple different 3rd Party System Interfaces if required to share DB data and code control.
13. The web-based service software shall be installed in the which shall be Enhanced as a gateway medium for QMS operation.
14. QMS application must have the capability of multiple-part tickets of different type of Patients. It must allow a Patient to be served at more than one counter or service one after another without taking a new ticket. Able to run 24 hours without shutting down and allow user to set the queue operation session time.
15. QMS Solution must be able to integrate with mobile apps solution. Mobile apps also can issue ticket for Patient.
16. QMS browser calling application should be compatible with Windows, Android, IOS and Linux.
17. QMS system administrator shall have the following rights:

User Administration

1. Add new user
2. View user
3. Remove user
4. Edit user
5. Assign user to Administrator
6. Shall be able to create at least 200 users' ID/accounts

QMS Configuration

1. Link counter by Medical Service or Dept.
2. View linked services
3. Assign service to counter
4. Change ticket parameters

5. Create double tickets
 6. Voice announcement in multiple language
 7. Create priority and service management
- General Administration
1. Online Monitoring by Clinic, Medical Service, or Department
 2. View log report
 3. View pre-user defined statistical reports
 4. Search engine for selected records
 5. Customize reports using BI Tools.
 6. SMS & email alert to management exceeding service level waiting time
18. The minimum requirement for the hardware configuration for the Web-Server shall be as follows:
- A. Quad Core Intel Xeon Processor 2.66 GHz/800 MHz Dual Processors
 - B. Memory 8 GB DDR2
 - C. Storage capacity (2 x 500 GB SATA with 16MB cache)
 - D. S/RAID-1 with SATA 2
 - E. Gigabit Ethernet Adapter
 - F. 101 – Keyboard
 - G. DVD-ROM Combo Drive
 - H. 20” Ultra Sharp Flat Screen LCD
 - I. Optical Mouse
 - J. Windows server 2012 R2

QMS Appointment application & Server

The web-based software shall be installed in the Appointment Server mainly to support the QMS appointment slots creation and for public to make the necessary appointment. The main Functions are as follows:

- a. The Appointment server is to provide patients appointment information and to allow them to make the necessary slots booking for their respective appointments.
 - b. The software to build the Appointment server shall be either IIS or Apache service.
 - c. A user-friendly web-based interface shall be designed for QMS administrator to manage the QMS Appointment configurations.
-
- A. The system must allow flexibility of changing patients appointment which has been made and also to indicate the necessary criteria if the appointment is unable to be made.
 - B. The system MUST be able to handle a least 20000 transactions per day.
 - C. The system shall have load-levelling capability. The load levelling facility shall be user-definable such that at any point in time, the System Administrator should be able to distribute the Queue-Token appointment load accordingly.
 - D. At any time during the Appointment locking-cycle, there should not be any duplication of numbers being appeared at the same time at the same rooms or same

appointment being made to 2 different rooms.

- E. Security measures shall be provided so that only valid patients shall have access to the system. There shall also require necessary firewall limitations when opening the environment to public. Recurring charges for external connection shall be borne by the users but the initial setup charges shall comprise part of the contract price.
- F. There should be an Online Administrative Panel (Software) for monitoring the Appointment Queue-Token-Flow / Workload for the all the Department.
- G. The system shall have the capability to detect any system fault or breakdown and informs the Administrator of the fault. Any malfunction of the system in one operation section or hardware fault at any of the peripheral equipment should not adversely affect the functioning of the system in other operational sections or lead to a total system failure.
- H. The Appointment Queue-Token software shall be customised according to the Hospital Department's operational requirement. QMS appointment module should able to integrate to Government web centralized appointment.
- I. QMS system administrator shall have the following rights:
 - a. User Administration
 - 1. Add new user
 - 2. View user
 - 3. Remove user
 - 4. Edit user
 - 5. Assign user to Administrator
 - 6. Shall be able to create at least 200 users' ID/accounts
 - b. QMS Appointment Configuration
 - A. Link counter by Medical Service or Dept.
 - B. View linked services
 - C. Assign available slots to a service to a clinic
 - D. Change doctors' parameters
 - E. Appointment slot change status in color code
 - F. Dr. able to view list of today's appointment
 - c. General Administration
 - 1. Online Monitoring by Clinic, Medical Service, or Department
 - 2. View log report
 - 3. Appointment SMS & email Text
 - 4. Search engine for selected records
 - 5. Others

- J. The minimum requirement for the hardware configuration for the Appointment-Server shall be as follows:
- A. Quad Core Intel Xeon Processor 2.66 GHz/800 MHz Dual Processors
 - B. Memory 8 GB DDR2
 - C. Storage capacity (2 x 500 GB SATA with 16MB cache)
 - D. S/RAID-1 with SATA 2
 - E. Gigabit Ethernet Adapter
 - F. 101 – Keyboard
 - G. DVD-ROM Combo Drive
 - H. 20” Ultra Sharp Flat Screen LCD
 - I. Optical Mouse
 - J. Necessary modem connections with Firewall Support for external public interface
 - K. Windows server 2012 R2

QMS DB Server

QMS Application all transaction data shall be stored in MS SQL DB at centralized location.

The minimum requirement for the hardware configuration for the Appointment-Server shall be as follows:

- A. Quad Core Intel Xeon Processor 2.66 GHz/800 MHz Dual Processors
- B. Memory 8 GB DDR2
- C. Storage capacity (2 x 1 TB GB SATA with 16MB cache)
- D. S/RAID-1 with SATA 2
- E. Gigabit Ethernet Adapter
- F. 101 – Keyboard
- G. DVD-ROM Combo Drive
- H. 20” Ultra Sharp Flat Screen LCD
- I. Optical Mouse
- J. Necessary modem connections with Firewall Support for external public interface
- L. Windows server 2012 R2
- M. Windows SQL 2012 R2

QMS Backup Server

The contractor shall provide this redundant server configuration, which shall permit continued operation in the event when the Web-Server or the Appointment Server gives way due to hardware failure.

The database is to support in terms of information provider and archiving. In the Queue-Token Management System, there shall be four main databases to support the online operation and reporting as follow:

- A. Online database. The role is to support the daily activities such as transaction records, system login status, etc.
- B. System database. The design of this database is to setup the QMS configuration such as type of services, staff information, etc.

- C. Hardware configuration database. The installation of hardware configuration shall be stored in this database such as Browser terminal, token dispenser, kiosk etc.
- D. Archive database. The role is to archive Queue-Token records for reporting and analysis.
 - a. All configuration, sizing, installation and testing of the database shall be the responsibility of the respective SI.
 - b. The SQL database should be of Open License package for unlimited numbers of users.

The minimum requirement for the hardware configuration shall be as follows:

- A. Quad Core Intel Xeon Processor 2.66 GHz/800 MHz Dual Processors
- B. Memory 8 GB DDR2
- C. Storage capacity (2 x 500 GB SATA with 16MB cache)
- D. S/RAID-2 with SATA 2
- E. Gigabit Ethernet Adapter
- F. 101 – Keyboard
- G. DVD-ROM Combo Drive
- H. 20” Ultra Sharp Flat Screen LCD
- I. Optical Mouse
- J. Windows SQL 2012 R2
- K. Windows server 2012 R2

3. MULTIMEDIA DISPLAY PC

There shall be one Multimedia Display PC at Departments. The Multimedia Display PC shall be connected directly to the Hospital LAN and shall be equipped with Internet Browser for use with Browser based display application.

- a. The Multimedia software shall be installed at Display PC distributed output to multiple TV screen.
- b. The system shall be able to generate data for the following on-line information to be viewed on screen with the Browser based to show the status of the waiting time and service time for particular Department:
 - b.1 Multimedia software able to display previous called token number from Multiple rooms or counters on TV screen.
 - b.2 Token number should display along with patient name.
 - b.3 Display Room status on TV screen
 - b.4 Next waiting queue numbers for rooms or counter should be visible to all Waiting patient.
- c. Generate reports, View real time queue status and analysis for the departments.
- d. If there is a requirement to change the TV output to either Hospital Microsoft PowerPoint or Hospital important Flash Media, again the Administrator must able to perform this function at the comfort of his office using the Web-Portal.
- e. Consultation room waiting queue shall be display on TV screen.

- f. The users must also be able to schedule the operation of the Multi-media screens of whether to show TV information or other important messages such as Flash files, MS PowerPoint, or even AVI-Formatted files.
- g. The users must be able to pre-schedule media contents for next few days.
- h. The minimum requirement for the hardware configuration for the SW shall be as follows:
 - A. Intel i-7 3.0 GHz HD Graphic
 - B. Memory 4 GB DDR2
 - C. Storage capacity (2x500 GB SATA2)
 - D. Gigabit Ethernet Adapter
 - E. 101 – Keyboard
 - F. DVD Combo Drive
 - G. 20” Flat Screen Monitor
 - H. Mouse
 - I. Windows OS 8 or Above

4. QUEUE TOKEN MACHINE – TOUCH & BUTTON

- 4.1 The Queue-Token Machine shall be installed at near registration counter with touch screen and button based. Each type of service shall have its unique series of Queue-Token number with an Alphabet embedded in-front such as Department A – A0001~A9999, Clinic B – B0001~B9999.
- 4.2 The general requirement of the ticketing machine shall be:
- Compact and portable and durable for heavy usage;
 - Must be able to handle 20000 or more transactions per day;
 - Must be able to print bar-code;
 - Able to dispense tickets with neat edges;
 - Able to prompt users when ticket supply is running low;
 - Capable of high speed printing (at least 30 tickets per minute) and in thermal paper format;
 - Ticket length can be programmable and the ticketing machine must be thermal dispenser
 - The machine spare parts shall be easily available for at least 5 years
 - One Ticket roll with 20000 tickets should be used for token number issuing
 - Ticket printout must be in blue color
 - If required, card reader option should be able to use with touch & button token dispenser
 - If required, patient should be able to enter their name, contact details in touch dispenser
 - Hospital logo must printout on token.
 - Ticket finishing alert
 - Token machine able to restore previous token number after restart or power failure
 - Token machine able to print QR code. QR code will help patients to know current queue status.
- 4.3 The Queue-Token ticket shall contain the following information:
1. Hospital's and Department' name
 2. Date and time of issue
 3. Queue-Token number in numeric and bar-coded form (if required)

4. Counter numbers of the counters providing the services
5. Number of people waiting to be served / the next patients to be called to be served
6. Expected waiting time which shall be computed by the Queuing System; and Cautionary and/or customized messages, e.g. "Season's Greetings", "Queue-Token numbers may not be called in sequence". These words should be edited through the Web-System real time as and when the user would want to change.

5. SELF APPOINTMENT KIOSK

1. Ticketing machine shall be connected to the system using 10/100 BaseT using TCP/IP via RJ45 connection to the structured cable system;
2. Must be able to interface to Smartcard reader which shall automatically combine the ability to read magnetic card and provide Q ticket as per patient appointment.
3. Patients may enter appointment unique number and select doctor's name as per their visit.
4. Patients with a pre-arranged appointment shall be able to initiate/reset the scanner to read the appointment document. The ticketing machine shall then print the appropriate ticket for the Queue-Token number and appointment time as required if there is any appointment made prior to the arrival.
5. The enclosure to house the ticketing machine and the ticketing request panel must be ergonomic in design and shall be custom-made to fit into the existing facade of the surrounding;

5.1 Patient feedback system

Self appointment Kiosk will have Feedback option to capturing the best understanding of patient's thinking and Satisfaction regarding healthcare Service. The key to making timely and accurate service decisions is having access to real-time data analysis based on patient feedback.

Real-time Point-of-Experience feedback is then transformed into actionable reports through the Reporting tools. Reports can be pulled manually or pushed on a scheduled basis.

- a. Patient feedback system will accept patient name & mobile Number.
- b. Patient feedback system will have 1-10 questions or more as per Hospital Management decide. Virtual keypad options to make comment.
- c. Real time feedback alert by SMS & Email will send to management.

6. BROWSER BASED CALLING TERMINAL

- 6.1 Patient browser based calling terminal shall be residing in the Dr. Room & registration counter operating in an MS Windows environment. It shall be interfaced with the ticketing machine and has the ability to issue Queue-Token ticket by services.

The Patient browser based calling terminal shall be connected to the Dr. Desktop system using 100BaseT using TCP/IP via RJ45 connection to the structured cable

system and shall be equipped with internet browser software for use with Web based application.

6.2 The Patient browser based calling terminal must have the following standards features and functions:

- 1 Activated by keying user identity and password
- 2 User friendly menu driven drop down window box
- 3 QMS windows displays list of Queue-Token numbers to be served
- 4 Able to capture the statistics of the services provided
- 5 User friendly menu driven drop down window box
- 6 Calling a Queue-Token number sequentially and/or randomly
- 7 Calling the next Queue-Token number through scanning the bar-code
- 8 Queue-Token number on a Queue-Token ticket
- 9 Clearing an incorrectly keyed Queue-Token number when calling Queue-Token number randomly
- 10 Able to show waiting time of current patients and called-time statistics;
- 11 Change colour within the Queue-Token numbers to reflect the different state of the Queue-Token
- 12 Displaying the number of patients in the Queue-Token waiting to be served
- 13 Can transfer Queue-Token numbers between services within the Department;
- 14 Able to prompt staff if preset waiting time is exceeded either by pop-up alerts or by using a different colour change
- 15 Alerting the counter staff, through audio-visual means, when a patient has waited beyond a stipulated waiting time. The system shall have the facility to Allow the activation of separate 'alert' timeframe and for these to be reset or Changed by the user.
- 16 Storing and recalling (either manually or automatically) Queue-Token numbers for which no response has been received. The number of times a Queue-Token number can be stored in memory and automatically recalled later and the store duration shall be programmable to cater to different users' requirements; and
 - A. Providing log-on/off function to the Queuing System at specific counters.
 - B. Can change service and attend to patients with different transactions;
- 17 The transferred Queue-Token number shall be inserted in sequential order (First-In-First-Out) or based on Appointment Time slot.

The same Queue-Token number should be used for the patients through-out his her transaction until he/she leaves the place or stop the transaction at one particular counter which is the last place of visit.
- 18 Patients notes or remark can entered into customer details using browser terminal to record patient history.
- 19 Patient previous appointment and today appointment details should be available in browser terminal
20. Voice announcement calling must support multiple languages

7. **HARDWARE KEYPAD TERMINAL**

The Hardware keypad terminal shall be residing in the Dr. Room & registration counters. It

shall be interfaced with the Department Hub using RJ 11 OR 45 cable.

7.1 The Hardware Keypad terminal must have the following standards features and functions:

- a) Activated by keying user login password
- b) Next, Recall, Direct & Transfer button must have in hardware keypad
- c) Alert or alarm button
- d) Total number of patient waiting should visible on keypad LED screen
- e) Change priority
- f) Call a patient with specific token number
- g) Hardware keypad W 76mm, H 30mm.

8. PATIENT SMS SOLUTION

SMS Solution

There shall also be integration of the QMS to a SMS Portal whereby the patients can request for their position of Queue-Token numbers through the SMS. Please refer to the following below for more information.

- A. For a patient who has already registered for SMS and when his / her number has been a “missed call”, an SMS shall be automatically sent to the respective patients to indicate that he has been called.
- B. A patient can also request for the Queue-Token length by sending an SMS to the SMS Gateway for the respective replies stating the actual Queue-Token length.
- C. A patient can also SMS-In to register himself if has already made an appointment with the QMS Appointment System, whereby he shall be receiving his Queue-Token number through his mobile.
- D. The System shall also automate the SMS process for Appointment alerts days prior to the respective patients’ appointments.

9. LED QUEUE DISPLAY

LED Queue display shall be installed at registration counter to display latest token number counter wise.

The minimum requirement for the hardware configuration:

- A. 9 x 17 /24 /48 pixels LED Matrix
- B. Many fonts supported
- C. Scroll text in any direction
- D. Display counter status
- E. 3-4 Digit display

10. WEB BASED MANAGEMENT PORTAL

The web based management portal should contain report, Dashboard & Analysis module. The Queue-Token System shall monitor the patients flow and generate valuable information. It

shall give useful operating statistics to enable management to schedule and allocate optimal resources so as to maintain patients' satisfaction. It shall be able to generate statistical reports, and these reports shall be finalized after the award of the contract.

Reports must be able to generate in PDF, EXCEL & CSV format. Management portal should have BI Tools, users or management can configure reports template their self.

Management portal reports requirements are:

1. System shall send out auto-schedule reports to management.
2. All service summary report
3. Counter & Dr. Room performance report
4. Staff performance report
5. Overview daily, weekly & monthly report
6. Waiting time report
7. Transaction time Report
8. Matter code report
9. Waiting time per time period
10. Transaction time per time period
11. Token number wise report

Annexure-A

(Technical Specification for Active devices and Passive devices)

1.1 Technical Specification for Active devices and Passive devices

General Criteria-

- Switches: All Switches (Core, Distribution and Access) and Transceivers should be of same OEM.
- All Active components and passive components and Operations and maintenance services should be quoted with minimum 3 years warranty including 24 X 7 Technical Assistance support.
- The Access Switches should support link aggregation across the stack.
- All Switches should be manageable from the same NMS.
- All Core switches and Distribution switches must have dual redundant hot-swappable power supply.
- All switches should have inbuilt support for 802.3az/ Energy Efficient Ethernet/ Green Ethernet.
- All Switches should be configured to provide Wire-Speed Non-Blocking Switching.
- OEM must have direct support centre in India and must have direct support Infrastructure.
- OEM shall have ISO 9001 certification

1. Core Switch

Sr. no.	Specification
1	Core Switch should be configurable in a High Availability (Active-Active) mode with support for dual homing connections.
2	Core switch should be configured with appropriate supervisory hardware with redundancy in power supplies and fans.
3	Core Switch should be configured to provide Wire-Speed Non-Blocking Switching, distributed forwarding and Routing Performance at Layer 2 and Layer 3 on all ports.
4	The connected servers or switches should be attached using standard LACP for automatic load balancing and high availability.
5	Each Core Switch should have min 24 Ports 10G SFP+ wire speed from day 1. Also have 4-6 1G ports.
6	The ports on each core switch should be capable of supporting 1000Base-TX/1000Base-LX and 10G connectivity options.
7	It should support Unicast, Multicast routing and IPv4 and IPv6 routes.
8	Switch should support IEEE for user authentications, accounting, RADIUS and TACACS.
9	The Core Switches should support min 48K MAC addresses and min 2K active VLANs.
10	The Core Switches should support full Layer 2 features like STP, RSTP, MSTP, LAG, LACP, ACL, QoS and IGMPv1/v2 from day 1..

11	The Core Switches should support full Layer 3 features like PIM-DM/SM, OSPF, VRRP, PBR and BGP from day 1
12	The Core Switches should support full IPv6 features like MLDv1/v2, OSPFv3, VRRPv3, BGP4+ and IPv6 management from day 1.
13	Should support security features like standard / extended ACLs, based on port and/ or time.
14	The switch should have control plane policing feature to filter the unwanted traffic entering the CPU queues.
15	Should support MAC address filtering based on source and destination addresses.
16	The switch should support Non Stop Routing (NSR) / NSF / Graceful Restart/Hitless failover.
17	Each core switch must have Virtual Output Queuing or have minimum 8 or more Hardware QoS Queues to avoid head of line blocking/prioritizing multicast for live streaming in critical applications like PACS, HMIS, CCTV etc.
18	Switch should support CLI, SSHv2, telnet for management
19	The Core Switch should support SNMP v1, v2 & v3 for management. It should be manageable with any standard EMS/NMS.

2. Distribution Switch

Sr. No.	Specifications
1	The switch should have Dual hot-swappable power supplies.
2	Switch should have 24 x10G SFP+ ports.
3	Shall be 19" Rack Mountable.
4	1 RJ-45 serial console port.
5	The switch should support full Layer 2 & Layer 3 features like STP, RSTP, MSTP, VLAN, LAG, LACP, ACL, QoS, OSPF and IGMPv1/v2 from day 1.
6	Switch should support integration with RADIUS/ TACACS+ authentication servers.
7	Switch should support CLI, SSHv2, and telnet for Management.

3. Access Switch 24 Port

Sr. No.	Specifications
1	Access Switch should have 24 ports of 100/1000 RJ45 and minimum 2 ports of 10G (2 SFP+ for uplink).
2	The Access switch should support VLANs.
3	The Access Switch should support minimum stacking up to 4 units. Cost of the stacking modules/Ports should be included.
4	The Access Switches should support link aggregation across the stack.
5	The connected servers or switches should be attached using standard LACP for automatic load balancing and high availability.
6	The Access Switch should support full Layer 2 features like STP, RSTP, MSTP, LAG, LACP, ACL, QoS.
7	The Access Switch should support basic L2 features like IPv4 & IPv6 static routing.
8	The Access Switch should support IPv6 management features like IPv6 ping, IPv6 trace route, IPv6 Telnet, IPv6 TACACS, IPv6 DNS, and IPv6 RADIUS.

4. Access Switch 24 Port POE

Sr. No.	Specifications
1	Access Switch should have 24 ports of 100/1000 PoE+(802.3 at) RJ45 and <i>minimum</i> 2 ports of 10G (2 SFP+ for uplink).
3	The Access switch should support min VLANs.
4	The Access Switch should support minimum stacking up to 4 units. Cost of the stacking modules/Ports should be included.
5	The Access Switches should support link aggregation across the stack.
6	The connected servers or switches should be attached using standard LACP for automatic load balancing and high availability.

7	The Access Switch should support full Layer 2 features like STP, RSTP, MSTP, LAG, LACP, ACL, QoS.
8	The Access Switch should support basic L3 features like IPv4 & IPv6 static routing.
9	The Access Switch should support IPv6 management features like IPv6 ping, IPv6 trace route, IPv6 Telnet, IPv6 TACACS, IPv6 DNS, and IPv6 RADIUS.
10	All the ports should be usable at full power.

5. Access Switch 48 Port

Sr. No.	Specifications
1	Access Switch should have 48 ports of 100/1000 RJ45 and <i>minimum</i> 2 ports of 10G (2 SFP+ for uplink).
2	The Access switch should support VLANs.
3	The Access Switch should support minimum stacking up to 4 units. Cost of the stacking modules/Ports should be included.
4	The Access Switches should support link aggregation across the stack.
5	The connected servers or switches should be attached using standard LACP for automatic load balancing and high availability.
6	The Access Switch should support full Layer 2 features like STP, RSTP, MSTP, LAG, LACP, ACL, QoS.
7	The Access Switch should support basic L2 features like IPv4 & IPv6 static routing.
8	The Access Switch should support IPv6 management features like IPv6 ping, IPv6 trace route, IPv6 Telnet, IPv6 TACACS, IPv6 DNS, and IPv6 RADIUS.

6. Indoor Wireless Access points

Vendor should provide atleast “very good” signal quality consistently at all points in the premises. A heat map of whole premises should also be provided without any blackholes after conducting a site survey.

S.No	Specifications Indoor AP
	Indoor Access Points 802.11a/b/g/n/ac Wave 2
1	Access Point radio should be minimum 4x4 MU- MIMO with 4 spatial streams on 5GHz and should also have 2.4GHz.
2	Access Point should be 802.11ac Wave 2.
3	AP should have 1 G PoE LAN port.
4	802.11 a/b/g/n/ac functionality certified by the Wi-Fi alliance.
5	Access Point can have integrated or external Antenna.
6	The Max transit power of the AP + Antenna should be as per WPC norms for indoor Access Points. OEM to give a undertaking letter stating that the AP will be configured as per WPC guidelines for indoor AP and also submit the WPC certificate showing approval.
7	Access point could have Internal/External Bluetooth Low energy beacon to support advance location based services for Mobile engagement solutions and applications.
8	Should support 8x BSSID per AP radio.
9	The access point should be capable of performing security scanning and serving clients on the same radio. It should be also capable of performing spectrum analysis and security scanning using same radio.
10	Should support BPSK, QPSK, 16-QAM, 64-QAM and 256 QAM (256 QAM for 802.11ac only).
11	Access point should have console port or SSH/Telnet access. Must support telnet and/or SSH login to APs directly for troubleshooting flexibility.
12	Must support Proactive Key Caching and/or other methods for Fast Secure Roaming.
13	Must operate as a sensor for wireless IPS
14	AP model proposed must be able to be both a client-serving AP and a monitor-only AP for Intrusion Prevention services
15	The Access Point should have the technology to improve downlink performance to all mobile devices.
16	Access point must incorporate radio resource management for power, channel, coverage hole detection and performance optimization
17	AP mounting kit should be with locking mechanism/ Kensington Lock so that AP cannot be removed without using special tools.
18	AP should be UL 2043 certified.

19	Must support Power over Ethernet, local power (DC Power), and power injectors.
20	802.11e and / or WMM
21	Must support QoS for voice and video etc.
22	Access Point should be 802.11 DFS certified
23	AP should be manageable with wireless access controller.

7. Wireless Controller & Security Solution

Security and Advanced WIDS/WIPS Features may be either integrated with controller or separate. (If separate then both should be of same OEM)

S.no	Specifications
	Hardware Specifications
1	Each WLAN Controller should support minimum of 1500 Access points. If any bidder can't provide WLAN controller to support 1500 AP in single RU form factor, multiple controllers, controllable through single master console, must be proposed to meet the requirement. The proposed controller should support N+N redundancy.
2	Should have atleast 2 x 10 Gigabit Ethernet interface.
3	Controller should have required console port and USB ports.
4	Controller should have internal hot swappable redundant power supply.
5	Controller should have capacity to handle minimum 20000 or more concurrent devices.
6	The controller should support 802.11ac standard.
	Wireless Controller Features
7	The Controller must support an ability to dynamically adjust channel and power settings based on the RF environment.
8	The Controller RF management algorithm must allow adjacent APs to operate on different channels, in order to maximize available bandwidth and avoid interference. Quoted Access point must support necessary spectrum analysis functionality to achieve this.
9	The Controller must support interference detection and avoidance for both Wi-Fi and non-Wi-Fi interference.
10	Must support coverage hole detection and correction that can be adjusted on a per WLAN basis.

11	The controller should support advance QOS to implement role based access for data, voice and video applications. It should support session prioritization as well like Voice, Video, should get different QoS.
12	Support profiling of wireless devices based on known protocols like http and dhcp to identify clients
13	Should support visibility and control based on the type of applications
14	The controller should provide differentiated access for Guests and valid user groups. Guests should have restricted access (without telnet & SSH services). Similarly other ROLE BASED ACCESS policy support should be available for differentiated access.
15	The controller should provide latest network authentication (WEP, WPA, WPA2) and encryption types like TKIP and AES.
16	Controller should support reliable fast roaming standards 802.11k/r
17	Controller should support management frame protection.
18	The Controller Should provide a dashboard of spectrum quality in terms of the performance and impact of interference on the wireless network identifying the problem areas and channel utilization. Quoted Access Point should support this feature to send necessary data to controller.
19	The Controller should provide a spectrum Quality detail on a per- radio basis to help gauge the impact of interference on the network. Quoted Access Point should support this feature to send necessary data to controller.
	Security and Advance WIDS/WIPS Features
20	Should support web-based authentication to provide a browser-based environment to authenticate clients that do not support the IEEE 802.1X supplicant.
21	Should support port-based and SSID-based IEEE 802.1X authentication.
22	Should support MAC authentication to provide simple authentication based on a user's MAC address.
23	WLC Should support Rogue AP detection, classification and standard WIPS signatures.
24	WLC should be able to exclude clients based on excessive/multiple authentication failure.
26	WIPS solution should Automatically blacklist clients when it attempts any attack.

27	WIPS solution should be capable of wireless intrusion detection & prevention . The WLAN should be able to detect Rogue AP and take corrective action to prevent the rogue AP. The system should detect and prevent an organization's wireless client connecting to rogue AP and also prevent an outside client trying to connect to organizational WLAN.
28	The WIPS solution should detect and protect if a client/tool tries to flood an AP with 802.11 management frames like authenticate/associate frames which are designed to fill up the association table of an AP.
29	The system should detect an invalid AP broadcasting valid SSID and should prevent valid clients getting connected from these AP's.
30	WIPS Solution should track the location of interferer objects.
31	For advance forensic WIPS solution should perform spectrum analysis to detect and classify sources of interferences. System should provide chart displays and spectrograms for real-time troubleshooting and visualization.
32	The WIPS solution should be able to detect and locate the rogue access point on floor maps once detected with NMS.

8. NETWORK MONITORING SYSTEM (NMS)

NETWORK MONITORING SYSTEM (NMS)	
Sr. no.	Specifications
1	The complete Network Management Solution (hardware and software etc.) providing secured web-based consoles to monitor devices as per BOQ, including servers and Applications. It should have scalability to manage up to 2500 devices approx. with support for SNMP v1-3, IPV4 & IPV6. It should be certified to run on Linux/CentOS/RHEL/Ubuntu/Other Linux.
2	The Network Management Software should provide a customizable at-a-glance summary of all discovered devices, including inventory and event summary information used to proactively identify problem areas and help prevent network downtime.
3	The Network Management Software should be able to discover layer3 & layer 2 heterogeneous environment and configure, monitor, manage, and deploy configurations to dynamically update groups of devices including virtual servers.
4	The Network Management Software should allow flexible definitions of administrator roles and responsibilities with RBAC (Role based Access Control) for different teams.

5	The Network Management Software should provide an interface to configure and deploy Command Line Interface (CLI) based configuration templates across one or more IP devices.
6	The Network Management Software should enable performance management by providing customizable dashboard(s).
7	The Network Management Software should be able to generate reports designed to summarize utilization of and traffic patterns on network interfaces.
8	The Network Management Software should be able to provide real-time network monitoring and accounting capabilities without impacting network performance.
9	The Network Management Software should allow administrators to track device configuration changes, enabling viewing, retrieval, and restoration of configuration files, and monitoring of configuration for troubleshooting purposes.
10	Solution must provide Wireless LAN Planning and Design, Network Monitoring and Troubleshooting, Indoor location monitoring capability, Centralized Software updates, Network mapping with floor plans for easier automated site survey.
11	Display the location of each rogue device on a building floor plan.
12	System should provide current list of clients connected to each AP, graphical details of wireless traffic & data rates on a per client basis, recent history of association with APs & adhoc networks for clients, alerts when wireless clients use interface bridging or Internet.
13	System should provide DNS response times for every user. Aggregated DNS response information per server.
14	System should provide client troubleshooting information including Association time.
15	Connection Sharing, trends for WLAN performance parameters, alert when wireless bandwidth is being wasted due to excessive auxiliary traffic, trends for WLAN performance parameters
16	System must be able to maintain recent history of connected clients for each AP for up to 2 years. Archive of logs.
17	The operations solution should provide a network “dashboard” on screens, providing up-to-date network-wide information on key usage and performance metrics. The operations solution should monitor all network devices including edge switches to which wireless devices are connected.

9. FIREWALL

Sr. No.	Firewall
1	The Firewall should be Hardware based, Reliable, purpose-built security appliance with hardened operating system that eliminates the security risks associated with general-purpose operating systems
2	The Proposed Firewall Vendor should be in the Leaders Quadrant of Gartner Magic Quadrant for NGFW.
3	Firewall appliance should have at least 8 x 1GE interfaces, 4 x 1GE SFP interfaces 2 x 10G SFP+ interfaces
4	Firewall Throughput should be 30 Gbps
5	Firewall should support minimum 12 Gbps of VPN throughput
6	Firewall should support 1200 site-to-site & client to site VPN Tunnels
7	Firewall should support minimum 2,000 concurrent SSL VPN users and should be scalable in future
	Firewall should support minimum 2000 concurrent users and should be scalable in future
8	Firewall should support 150,000 new sessions per second
9	Firewall should support 6 Million concurrent sessions
10	The solution should support minimum 5 Gbps of NGFW (FW + IPS + AVC) throughput for Mix / production traffic
11	The solution should support minimum 3 Gbps of Threat Prevention (FW + IPS + AVC + AV) throughput for Mix / production traffic
12	The Firewall solution should support NAT64, DNS64 & DHCPv6
13	The proposed system shall be able to operate on either Transparent (bridge) mode to minimize interruption to existing network infrastructure or NAT/Route mode. Both modes can also be available concurrently using Virtual Contexts.
14	The proposed system should have integrated Traffic Shaping functionality.
15	The Firewall & IPSEC VPN module shall belong to product family which minimally attain Internet Computer Security Association (ICSA) Certification.
16	The proposed system should support
	a) IPSEC VPN
	b) PPTP VPN
	c) L2TP VPN

17	The device shall utilize inbuilt hardware VPN acceleration:
	a) IPSEC (DES, 3DES, AES) encryption/decryption
	b) SSL encryption/decryption
18	The system shall support the following IPSEC VPN capabilities:
	a) Multi-zone VPN supports.
	b) IPsec, ESP security.
	c) Supports NAT traversal
	d) Supports Hub and Spoke architecture
	e) Supports Redundant gateway architecture
19	The system shall support 2 forms of site-to-site VPN configurations:
	a) Route based IPsec tunnel
	b) Policy based IPsec tunnel
20	The system shall support IPSEC site-to-site VPN and remote user VPN in transparent mode.
21	The system shall provide IPv6 IPsec feature to support for secure IPv6 traffic in an IPsec VPN.
	Virtualization
22	The proposed solution should support Virtualization (Virtual Firewall, Security zones and VLAN).
	Intrusion Prevention System
23	The IPS capability shall minimally attain NSS Certification
24	IPS throughput should be minimum 8 Gbps for Mix / Production traffic
25	The IPS detection methodologies shall consist of:
	a) Signature based detection using real time updated database
	b) Anomaly based detection that is based on thresholds
26	The IPS system shall have at least 7,000 signatures
27	IPS Signatures can be updated in three different ways: manually, via pull technology or push technology. Administrator can schedule to check for new updates or if the device has a public IP address, updates can be pushed to the device each time an update is available

28	In event if IPS should cease to function, it will fail open by default and is configurable. This means that crucial network traffic will not be blocked and the Firewall will continue to operate while the problem is resolved
29	IPS solution should have capability to protect against Denial of Service (DOS) and DDOS attacks. Should have flexibility to configure threshold values for each of the Anomaly. DOS and DDOS protection should be applied and attacks stopped before firewall policy look-ups.
30	IPS signatures should have a configurable actions like terminate a TCP session by issuing TCP Reset packets to each end of the connection, or silently drop traffic in addition to sending a alert and logging the incident
31	Signatures should a severity level defined to it so that it helps the administrator to understand and decide which signatures to enable for what traffic (e.g. for severity level: high medium low)
	Antivirus
32	Firewall should have integrated Gateway Antivirus solution
33	The proposed system should be able to block, allow or monitor only using AV signatures and file blocking based on per firewall policy based or based on firewall authenticated user groups with configurable selection of the following services:
	a) HTTP, HTTPS
	b) SMTP, SMTPS
	c) POP3, POP3S
	d) IMAP, IMAPS
	e) FTP, FTPS
34	The proposed system should be able to block or allow oversize files based on configurable thresholds for each protocol types and per firewall policy.
	Web Content Filtering
35	The proposed system should have integrated Web Content Filtering solution without external solution, devices or hardware modules.
36	The proposed solution should be able to enable or disable Web Filtering per firewall policy or based on firewall authenticated user groups for both HTTP and HTTPS traffic.
37	The proposed system shall provide web content filtering features:
	a) which blocks web plug-ins such as ActiveX, Java Applet, and Cookies.
	b) Shall include Web URL block

	c) Shall include score based web keyword block
	d) Shall include Web Exempt List
38	The proposed system shall be able to query a real time database of over 110 million + rated websites categorized into 70+ unique content categories.
	Application Control
39	The proposed system shall have the ability to detect, log and take action against network traffic based on over 2000 application signatures
40	The application signatures shall be manual or automatically updated
41	The administrator shall be able to define application control list based on selectable application group and/or list and its corresponding actions
	Data Leakage Prevention
42	The proposed system shall allow administrator to prevent sensitive data from leaving the network. Administrator shall be able to define sensitive data patterns, and data matching these patterns that will be blocked and/or logged when passing through the unit.
	High Availability
43	The proposed system shall have built-in high availability (HA) features including associated accessories, cables etc.
44	The device shall support stateful session maintenance in the event of a fail-over to a standby unit.
45	High Availability Configurations should support Active-Active and Active-Passive.
	Logs and Reports
46	Should have atleast 500 GB of Hard Drive Capacity for logging and reporting.
	It should automatically transfer the archives of the logs to a NAS.
47	Real-time display of information to follow real-time trends in network usage such as the source IP address and the destination URL for HTTP/HTTPS traffic.
	Management
48	Management solution (virtual appliance) for all the appliances shall be provided
49	Should be configurable using CLI, GUI interface and central management software. Should support SNMP, SSH, Telnet, HTTP(s)
50	The management system must be capable of pushing NGFW security policies and configurations to individual or multiple NGFWs through secure, encrypted connection

	interfaces.
51	Supports role-based administration of NGFW
	License
52	3 Years 24x7 support and license for Gateway Antivirus, IPS, IDS, Web filter, Anti-Spam, application filtering, botnet, DLP and hardware support License.

10. Server Hardware (for NMS and DHCP and other virtual appliances)

Sr. No.	Item	Description
1	Server Form Factor	Rack mount
2	Processor type	Intel Xeon 64 bit Processor E5 6000 series v4 or Xeon Scalable Processor (12-core /16MB Cache min) or equivalent AMD Epyc Processor
3	Number of processors	2 Processor or superior
4	Standard memory	256 GB
5	Internal hard disk drive	Minimum 2 nos. 1.2TB 6G SAS 10k or higher, Hot swappable PLUS Minimum 1 no. 200 GB SATA / NVME SSD, Hot swappable Support for minimum 8 SFF/LFF SAS drives
6	Hard disk controller	Smart Array P420 /1GB FBWC Controller or equivalent or higher Support hardware RAID in 0/1/5/6/10/5plus spare configurations. Battery for power loss protection included Adequate number of cards to support all the 12 HDD bays should be provided from day one
9	Power Supply	Redundant N+N Hot Pluggable power supply
10	Network interface	At least Two Nos. Embedded Dual Port 10G SFP+ NIC
	Cooling Fans	N+N hot pluggable. Should be able to maintain temperature range XXXXXXXXXX
11	Management	IP based HTTP/HTTPS Management capability on atleast 1G network interface

13	Operating system Compatibility	Certified for Windows , RHEL/CentOS/Ubuntu/Fedora/Debian, VMWare
14	Accessories	All rails, cables, cords etc needed for installation of server in standard rack should be included
15	Software	VMWare license for two processors included

11. Intelligent integrated/inbuilt infrastructure Rack for network infrastructure: Smart Rack Type

Specifications	
1	<p>a) The detail specifications of the intelligent integrated/inbuilt infrastructure, standalone system shall be in adherence to TIA 942 guidelines thus shall be composed of multiple active power and cooling distribution paths, but only one path active. Shall have redundant components.</p> <p>b) The Intelligent Integrated Infrastructure essentially includes internal redundant or backup power supplies, environmental controls (e.g., precision air conditioning, fire suppression, smoke detection, Water leak detection, humidity sensor etc.), security devices etc. Critical systems like UPS and Precision Air-conditioning system will have N+N topology respectively.</p>
2	Integrated and contained Cabinet: 24U rack of 2200 mm maximum height with min 15U of usable space.
3	Integrated Cooling Systems Suitable for 1 kW IT load with variable Scroll Technology
4	3 KVA rack mount UPS 12 Volt SMF batteries with backup of 10 minutes. UPS should be mounted inside the integrated rack
6	Rack should have integrated Fire Detection system.
8	The Rack should have Monitoring capability
16	32 Amp single phase PDU with 12- IEC C13 and 4-IEC C19
17	Integrated rack should be supplied with inbuilt electrical distribution system.
	Cable manager included
18	Supplied with 5 years of warranty including batteries.
19	There should be a single window/OEM for services and maintenance for integrated rack.

CABLING FOR DATA SYSTEM

1. All Passive components (Copper and Fibre) must be from the same OEM.
2. For CAT 6 A cables including patch cords must be – each individual pair separately shielded.
3. Insulation must be fire retardant.
4. All CAT 6 A and Fibre cables must be LSZH.
5. The OEM shall be ISO 9001:2000certified
6. The OEM shall be ISO 14001accredited
7. The Copper and Fiber cabling system shall be certified by OEM to have application support warranty for 25years

COPPER CABLING SYSTEM

1.1 CAT6A Foiled TwistedPairCable	
Characteristic	Min. Required Specification
General Features	Category 6A must be solid copper conductor 23 AWG having NVP: 75-77% with 4 pair individually foiled LSZH cable and must be compliant with TIA/EIA-568-C.2/ 3P for 500MHz (ETL certificate to be enclosed along with the bid.
1.2 FACE PLATE: 1 port or two port	
Characteristic	Min. Required Specification
Features	Single/Double Gang as per the requirement & complete in all respect and as directed to the satisfaction of engineer
	Labeling provision must be there.
Characteristic	Min. Required Specification
1.3 CAT6A SHIELDED RJ45 JACK	
Features	Must be compliant with latest ISO/IEC 11801 A1.1 draft and ratified TIA/EIA 568-C.2/ 3P for the support of 10GBASE-T.
	Must use insulation displacement connectors (IDC)
	Allow for a minimum of 50 re-terminations without signal degradation.
	Be constructed of high impact, flame-retardant thermoplastic and robust die cast zinc alloy housing with icon options for better visual identification.
	With shutter provision to protect from dust and moisture. If shutter provision is

	not available on RJ45 jack it is acceptable on face plate also.
	It should follow 568A/B wire patterns/configuration
	Color options in jacks should be available.
	The I/O should be UL/ third party certified (Authorized of govt. agencies).
Mechanical Characteristic: Jack Connector	Plastic Housing: Robust die cast Zinc Alloy housing plated with Bright Nickel/Cu
	Operating Life: Minimum 750 insertion cycles
	Contact Material: Copper alloy / Gold-Plated Bronze
	Contact Plating: >0.75 micrometers Gold/Ni
Characteristic	Min. Required Specification
1.4 CAT 6A 24 PORT JACK / patch PANEL LOADED	
Features	Be made of steel/aluminum, in 24 port configurations. Each jack for the jack panel should have shuttered or dust cover with jack for dust free environment.
	Have port identification numbers on the front of the panel.
	Should have self-adhesive, clear label holders (transparent plastic window type) and white designation labels with the panel, with optional color labels / icons.
	Each port / jack on the panel should be individually removable on field from the panel.
	Should be certified by third Party like UL. Certificates to be submitted with bid.
	Should be supplied with metallic rear cable management shelf/support bar as a part of Jack Panel.
1.5 CAT 6A SHIELDED PATCH/MOUNTING CORDS (1 Mtr., 2 Mtr. and 3 Mtr.)	
Characteristic	Min. Required Specification
Features	Category 6A Equipment cords (Length – 1mtr and 3mtr.)
	The work area equipment cords shall be comply with TIA/EIA-568- C.2/3P Performance Specifications for 4 pair Category 6A Cabling.

	Category 6A equipment cords: Shall be round, and consist of eight insulated 26 AWG, stranded bare copper conductors, arranged in four color-coded twisted-pairs each pair should be foiled with aluminum shield.
	Equipped with 8-position shielded plugs on both ends, wired straight through with standards compliant wiring.
	Should have 50 micro inches of gold plating over nickel contacts.
	Modular cords should include a molded strain relief boot.
	Should be certified by UL/ third party.
MechanicalCharacteristic: patch cord Cable	Conductor size: 26 AWG stranded bare copper.
MechanicalCharacteristic: Plug	Jacket: LSZH
	Temperature range: -10°C to +60°C
	Operating life: Minimum 750 insertion cycles
	Contact Material: Copper alloy/Gold-plated bronze
	Contact plating: >0.75 micrometers Au/Ni

2.0 OPTICAL FIBER CABLING:

2.1 24 Core Single-Mode(SM) 9/125 μm OS2 Armoured Multi-Tube Optical Fiber Cable 6 cores, 12 cores and 24 cores:-

Characteristic	Min. Required Specification	
Features	The fiber type should be 9/125 μm , OS2 Matched Cladding Single Mode optical fiber.	
	Fiber should be coated with acrylate coating.	
	The fiber should be optimized for operation at 1310 nm and at 1550 nm.	
	Should fulfill the requirements of ISO.IEC 11801 - 2nd Edition, type OS2, ITU-T REC G 652D specification.	
Physical Characteristics:-	No of Cores	6 core, 12 cores and 24 cores
	Nominal mode field diameter	9 μm
	Mode field diameter tolerance	$\pm 0.5\mu\text{m}$

	Cladding diameter	125 μm
	Cladding diameter tolerance	$\pm 1.0 \mu\text{m}$
Optical Characteristics:-	Attenuation (of cable with fibers):	
	At 1310 nm	$\leq 0.35 \text{ dB/km}$
	At 1550 nm	$\leq 0.22 \text{ dB/km}$
	Polarisation Mode Dispersion (PMD)	$\leq 0.06(\text{ps/sq km})$
	Proof Stress level	$> 0.7 (\sim 1\%) \text{ GPa}$
	Core-Cladding Concentricity error	$\leq 0.5 \mu\text{m}$
	Cladding non-circularity	$\leq 0.7 \%$
	Diameter of outer coating layer	$242 \pm 5 \mu\text{m}$
	Cut-off wavelength	$\leq 1260 \text{ nm}$
Construction Details:-	CORE	Germanium doped core with no phosphorus i.e. reduced tendency for hydrogen degradation.
	COATING	UV-curable dual layer acryl ate coating, which ensures excellent micro bending and abrasion resistance.
	Fibre/Tube Identification	Color coded
	Fibre protection(Tubes)	Polybutylene Terephthalate (PBT)
	Armor	Corrugated Steel tape Armor (ECCS Tape)
	Inner Jacket	High density polyethylene
	Outer Jacket	UV Stabilized High density polyethylene (HDPE) LSZH.
	Outer Jacket Color	Black
Central Strength Member	Fibre Reinforced Plastic(FRP)	
Dimensions:-	Cable Diameter	$15.1 \pm 4.0 \text{ mm}$
Mechanical and Environmental	Max Bend Radius(full load)	10 X Overall diameter
	Max. Bending Radius (during installation)	20 X Overall diameter
Performance:-		

	Max. Tensile Strength-Short Term	Minimum 2000N
	Max. Crush Resistance-Short Term	Minimum 4000N/10 cm
	Operating Temperature range	-10°C to +70°C
2.2 12 CORE Multi-Mode 50/125 µm OM4 Armoured Multi-Tube Optical Fiber Cable 6 cores and 12 cores:-		
Characteristic	Min. Required Specification	
Features	The fiber type should be 50 / 125, OM4 Graded Index Fiber cable	
	Fiber shall be coated with acrylate coating.	
	The fiber should be optimized for operation at 850 nm and at 1300 nm.	
	Should fulfill the requirements of ISO/IEC 11801:2002- 2nd Edition, Type OM4;	
Physical Characteristics:-	No of Cores	6 cores and 12 cores
	Nominal mode field diameter	50 µm
	Mode field diameter tolerance	±2.5µm
	Cladding diameter	125 µm
	Cladding diameter tolerance	±2.0 µm
Optical Characteristics:-	Attenuation (of cable with fibers):	
	At 850 nm	≤2.7dB/km
	At 1300 nm	≤ 0.8 dB/km
	Bandwidth:	
	At 850 nm	≥ 2000 MHz · km
	At 1300 nm	≥ 500 MHz · km
	Numerical aperture	0.200 ± 0.015
	Diameter of outer coating layer	245 µm (without coloring layer)
	Tolerance of coating layer diameter	±10 µm
Construction Details:-	CORE	Germanium doped core with no phosphorus i.e. reduced tendency for hydrogen degradation.

	COATING	UV-curable dual layer acryl ate coating, which ensures excellent micro bending and abrasion resistance.
	Fibre/Tube Identification	Color coded
	Fibre protection(Tubes)	Polybutylene Terephthalate (PBT)
	Armor	Corrugated Steel tape Armor (ECCS Tape) Thickness.
	Inner Jacket	High density polyethylene
	Outer Jacket	UV Stabilized High density polyethylene (HDPE) LSZH.
	Outer Jacket Color	Black
	Central Strength Member	Fibre Reinforced Plastic(FRP)
Dimensions:	Cable Diameter	15.1 ± 4.0 mm
Mechanical and Environmental Performance:-	Max Bend Radius(full load)	10 X Overall diameter
	Max. Bending Radius (during installation)	20 X Overall diameter
	Max. Tensile Strength-Short Term	Min 2000N
	Max. Crush Resistance-Short Term	Min 4000N/10 cm
	Operating Temperature range	-10°C to +70°C
2.3 Fiber Optic LIU:-		
Fiber optic patch panel	Fibre management enclosures that can be used as a wall mount enclosure for isolated applications or rack mount enclosure for integrated applications.	
Height	1 U, 1.75 inches	
No. of fiber ports	12/24	
Material	Powder coated Mild Steel/aluminum	
	Rugged steel/aluminum construction in graphite finish	
	Rear, side & base access for Incoming / Outgoing fiber cables	
Cable Management rings	Management rings within the system to accommodate excess fibre cordage behind the through adapters and maintain fibre bend radius.	

Adaptor Slots	Built in Slots for LC adaptors.
Sliding cover	Panel cover is of slide out for easy operation & maintenance
Splice Tray	24Fiber Splice Tray of ABS material should be supplied for the LIU.
<u>2.4 Fiber Optic Adaptors (Single mode):-</u>	
<u>Fiber optic adaptors</u>	<u>LC Type Single Mode Adaptors</u>
Type	LC Type
	Meets TIA/EIA 568-C.3 and IEC 874-109 standards
	Adaptors should be snap mount for easy insertion and removal.
	Shuttered feature protects from light emissions and dust.
Material Ferrule	Zirconia Alignment sleeve
<u>2.5 Fiber Optic Pigtail 9/125 Singlemode OS2 LC Type:-</u>	
<u>Fiber optic pigtails</u>	<u>Single mode OS2 Pigtails with LC connector</u>
Type	9/125 micron OS2 fibre performance
Cordage Outer Diameter:	2.0mm \pm 0.1mm x 4.1 \pm 0.2mm
Cable	900 μ m Tight Buffered
Retention Strength	100N
Jacket Material	LSZH
Operating Temp.	-10°C to 75°C
Connector Insertion Loss	0.30dB(Max)
<u>2.6 Fiber Optic Patch Cord LC-LC 9/125 OS2 Singlemode:-</u>	
<u>Fiber Optic Patch Cords</u>	<u>LC-LC 9/125 μm, OS2 Singlemode Duplex Patch Cord</u>
Cable	9/125 μ m, OS2 SM, Duplex patch cord.
Connectors	The optical fiber patch leads shall comprise of Single-mode 9/125 μ m OS2 fiber

	with 2x LC type fiber connectors terminated at both end of the patch cord.
Cordage O.D	(Duplex): 2.0mm \pm 0.1mm x 4.1 \pm 0.2mm
Cable	900 μ m Tight Buffered
Strength Member	Aramid Yarn
Jacket Material	LSZH
Connector Loss	0.30dB(max)
Operating Temperature	-10°C to +70°C
*For 100G connectivity for distance of 2KM Required trans-receivers, patch cords etc.	
<u>2. 7 Fiber Optic Adaptors (Multimode):-</u>	
<u>Fiber optic adaptors</u>	<u>LC Type Multimode Adaptors</u>
Type	LC Type
	Meets TIA/EIA 568-B.3 and IEC 874-109 standards
	Adaptors should be snap mount for easy insertion and removal.
	Shuttered feature protects from light emissions and dust
Material Ferrule	Zirconia Alignment sleeve
Insertion Loss	<0.34dB Max
Operating Temperature	-10°C to +70°C
<u>2. 8 Fiber Optic Pigtail 50/125 Multimode OM4 LC Type:-</u>	
<u>Fiber optic pigtails</u>	<u>Multimode OM4 Pigtails with LC connector</u>
Type	50/125 micron OM4 fibre performance
Cordage Outer Diameter:	2.0mm \pm 0.1mm x 4.1 \pm 0.2mm
Buffer Diameter:	900 μ m
Primary Coating :	245 μ m

Jacket Material:	LSZH
Operating Temp.	-10°C to +60°C
Connector Insertion Loss	0.30dB(Max)
2.9 Fiber Optic Patch Cord LC-LC 50/125 OM4 Multimode:-	
Fiber Optic Patch Cords	LC-LC 50/125 μm, OM4 Multimode Duplex Patch Cord
Cable	50/125 μm, OM4 MM, Duplex Zipcord.
Connectors	The optical fiber patch leads shall comprise of Multi-mode 50/125μm OM3 fiber with 2xLC type fiber connectors terminated at both ends of the patch cord.
Cordage O.D	(Duplex): 2.0mm ± 0.1mm x 4.1± 0.2mm
Buffer Diameter	900μ tight buffer
Strength Member	Aramid Yarn
Jacket Material	LSZH
Connector Loss	0.30dB(max)
Operating Temperature	-10°C to +70°C
2.10 Gang Box (As per approved make)	
Gang Box	Surface mounted , Plastic/ PVC Material, White Colour, supports one or two I/O ports
2.11 Cat 6 Unshielded RJ45 Connectors (As per approved make)	
RJ45 unshielded Connector	Standard Acrylic unshielded RJ45 connector

Annexure-B

(Technical Specification for Desktop, Tablet etc.)

1. Desktop All in One Computer (i5 Based)

Specification Sheet- Desktop Computer		
Sr. No.	Description	Specification
1.	Processor	Intel Core i5 with 3.6 GHz, 3MB cache or Higher
2.	Memory	4 GB RAM or Higher
3.	Hard Disk Drive	1 TB 7200rpm or higher
4.	DVD Drive	DVD RW Drive
5.	Network Card	Integrated 10/100/1000 Gigabit Ethernet LAN
6.	Screen Size	57.5cm (23 inch) larger LED/TFT Digital Colour Monitor TCO-05 certified
7.	Keyboard	104 keys with USB interface
8.	Mouse	Optical with USB interface
9.	Interfaces/Port	6 USB Ports including 2 USB 3.0, audio ports for microphone and headphone.
10.	Operating System	Windows 10 Professional or Higher
11.	Warranty	Onsite 3 years warranty

2. Desktop Computer (i7 or i5 Based)

Specification Sheet- Desktop Computer		
Sr. No.	Description	Specification
1.	Processor	Intel Core i7 or i5 with 3.6 GHz, 3MB cache or Higher
2.	Memory	4 GB RAM or Higher
3.	Hard Disk Drive	1 TB 7200rpm or higher
4.	DVD Drive	DVD RW Drive
5.	Network Card	Integrated 10/100/1000 Gigabit Ethernet LAN
6.	Monitor	57.5cm (23 inch) larger LED/TFT Digital Colour Monitor TCO-05 certified
7.	Keyboard	104 keys with USB interface

8.	Mouse	OpticalwithUSBinterface
9.	Interfaces/Port	6USBPortsincluding2USB3.0,audioportsformicrophoneandheadphone.
10.	OperatingSystem	Windows10 Professional or Higher
11.	Warranty	Onsite3 yearswarranty

3. Latest Tablet

Specification Sheet- Latest tablet		
Sr. No.	Description	Specification
1.	Processor	1.5 GHz Quad Core Processor or higher
2.	Memory	4 GB RAM or Higher
3.	Internal Memory	Internal memory 16GB or higher Expandable Storage Capacity upto 64 GB or higher
4.	Primary Camera	8 MP Primary Camera or higher
5.	Secondary Card	5 MP Secondary Camera or higher
6.	Screen Size	8-inch TFT Capacitive Touchscreen or higher
7.	Connectivity	Wi-Fi, 4G Enabled, Bluetooth connectivity
8.	OperatingSystem	Android v5 or higher OS
9.	Warranty	Onsite3 yearswarranty
10.	Battery	Above 3000 mAH

4. Scanner

S No	Description	Specification
1	Scan Speed	15ppm or higher
2	Image Scan Rate	6 ipm or higher
3	Resolution	up to 2400x2400 dpi resolution
4	Duplex	Automatic

	Scanning	
5	Interfaces	1 Hi-Speed USB 2.0 Device, 1 Ethernet 10/100 Base-T(RJ45),
6	Scan Size	8.5x11 in (21.6 x 27.9 cm),8.5x14 in (21.6x35.5 cm)
7	OS Compatibility	Windows XP SP3 all 32-bit editions (XP Home, XP Pro, etc.), Windows Vista all 32-bit editions (Home Basic, Premium, Professional, etc.), Windows 7 all 32- and 64-bit editions, Windows 8/8.1 all 32- and 64-bit editions

5. NOTEBOOK PC

Specification Sheet- Notebook PC		
Sr. No.	Description	Specification
1.	Processor	Intel Core i7 with 3.6 GHz
2.	Memory	8 GB RAM or Higher
3.	Hard Disk Drive	1 TB 7200 rpm or higher
4.	DVD Drive	DVD RW Drive
5.	Network Card	Integrated 10/100/1000 Gigabit Ethernet LAN
6.	Monitor	38.1cm (15 inch) LED Screen
7.	Interfaces/Port	3 or more USB Ports including at least 1 USB 3.0, audio ports for microphone and headphone.
8.	Operating System	Windows 8.1 Professional or Higher
9.	Warranty	Onsite 3 year OEM warranty

Annexure-D

(Technical Specification of Hardware and Software for Library Management)

1. Library Management Software(LMS)

Item Name	Specifications
Library Management Software	<p>Library Management Software (LMS)</p> <ul style="list-style-type: none"> <li>• The LIBRARY SOFTWARE must support all the major library functions including acquisition, cataloguing, authority control, circulation, Web OPAC, serials control, import/export of records and reporting. <li>• Must be an open architecture system and should support various international standards. The system should also support the following internet standards TCP/IP, SMTP, MIME, HTTP, SSL. Interactions with external systems need to support the following standards: <ul style="list-style-type: none"> <li>a. ANSI/ISO Z39.50 (ISO 23950) on both server and client <li>b. Record syntaxes: MARC21, UNIMARC, USMARC <li>c. NCIP and SIP2 for RFID Integration <li>d. ISO 2709 <li>• The System must be capable of maintaining multiple languages using UNICODE. <li>• The System must have support for NCIP/SIP2 protocol for RFID transactions. <li>• The system must be able to handle barcodes in different formats like EAN-13, SICI/SISAC, Codabar. <li>• The hardware/server should run on UNIX/LINUX/Windows Platforms. <li>• Auto Daily backup should be possible <li>• Verification of users should be done in a secure manner and it should be possible to set different security setting for users. <li>• Live update of the support has to be provided. <li>• Application software must be web-based. The application should not require any proprietary software licenses. <li>• The backend database must be robust using either Microsoft SQL or Oracle or MySQL. <li>• The client operations must be web-based (platform independent). <li>• Librarian interface (client software) must be web-based. <li>• The main OPAC interface for the users outside the library must be a web browser, such as Internet Explorer and Firefox. <li>• The system must support the import and export of records from different type of

	<p>data media such as tape, CD-ROM, hard disk, and diskette.</p> <ul style="list-style-type: none">• The system should support online import and conversion of records from Z39.50 compliant databases.• Library system must support exhaustive management statistics and reporting functions allowing the library to be able to create their own reports.• OPEC access: [It must be possible to] allow access to Web-based services both from within the staff client as well as from the Web OPAC using the 856 link tag in a MARC record.• There must be provisions for different search levels (e.g., simple and advanced) in the OPAC.• All indexes and record displays must be updated in real-time. All fields and sub-fields should be available to be keyword and/or string indexed with a flexibility in defining indexes.• It should be possible to search a record as a whole (any field), specify any variable field to be searched and Boolean search.• Searching should be possible by including but not limited to author, title, subject, publisher, call number, standard number (e.g., ISBN, ISSN, etc.) and Barcode number.• Search refinement should be possible by author, series, topics, item type, location/branches, place of publication and availability.• Circulation System must have functions such as check-out (charges), renewals, check-in (discharges), reservations, fines and fees, statistics and reports.• The patron record should be in a MARC-like format and the patron record must include fields for the following information:<ul style="list-style-type: none">○ Borrower Card Number○ Name of the Candidate○ Father's Name○ Mother's Name○ Date of Birth○ Class (with subject)○ Department○ School○ Correspondence Address○ Permanent Address
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	<ul style="list-style-type: none"> ○ Contact Number (Mobile / Landline) ○ Email ID ○ Challan No with Date ● Barcode Generator system must include a utility that can be used to print barcode labels for the library items. ● Cataloguing system must be able to import records in the USMARC/MARC21 formats, online through a Z39.50 client which is integrated with the cataloguing (and acquisition) module. The system should have a reservoir for managing imported MARC records so that it can be checked before loading into database. ● Authority control must be possible to create and maintain authority control for the following search elements: personal and corporate names, conferences, uniform titles, series titles, subjects, name/title combinations and publishers. ● Data Entry system must have full screen data entry and editing ("empty screen" with MARC header) for cataloguing as well as a number of predefined data entry screens (templates). It must support hidden fields which can be seen in MARC editor but not in the OPAC. ● Output must be possible to exporting the bibliographic records in standard MARC communications format (ISO2709). ● Order initiation for titles indented ● Check for duplication of titles from 'on order', received and Web OPAC ● All data entered at acquisition section be used throughout system ● Placing Order: Firm orders for titles, including for materials received: ● Purchase orders printing/ (e)mailing ● Title / publisher/ vendor-wise order generation ● Incorporation of special delivery statements/ conditions ● Standing orders for annual publications ● Invoice Processing includes accessioning of items: ● Allows changes in units price, variable discount, exchange rate etc. ● Maintains exchange rates of various user defined currencies ● Accession number can either be generated automatically by the system or it can be a user defined number ● Updated funds accounts online ● Barcode generation
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- Order Follow Up: Periodic overdue notices/ reminders; and Online printing of follow up notices
- Serials Publications (Periodicals): New serials initiated, go through the approval process and ordering, duplicate checking, prints approval lists, updation of 'Approved' or 'Rejected' titles, prints purchase orders for single or package subscription, status mandatory, print purchase order by department/ publisher/ vendor wise and print order for single and package subscription.
- Renewal Order printing either by department / publisher/ vendor /Centre or Library, based on subscription expiry date, Separate orders for renewals and additional serials and cancel supply order of single or all titles from particular order
- Invoice processing, both for new subscription and subscription renewal must allow more than one invoice for an order, changes in subscription, period, volumes, issue nos., frequencies etc., accepts supplementary invoices for any title and; accept and updates subscriptions details.
- Well-designed screens requiring entry of minimum possible data
- Recording of issues by volume/issue number or date and barcode
- Facility to record receipt of regular issues, various indexes, special issues and additional issues
- Claims Monitoring must makes possible timely follow-up of 'not received', (missing issues and supply not started) overdue and damaged journal numbers and provision of claims for each title of package or bundle subscription.
- Routing and Circulation: User-defined routing of issues registered along with circulation of bound volumes and loose issues; routing of an issue immediately on arrival may be defined, before it is displayed or circulated; integrated with the circulation module and overdue reminders
- Provision of catalogue generation for current journals and serials holdings according to MARC-21
- Online Queries: Serials-related queries are titles in bindery and recent arrivals.
- Reports: Reports generated by the Serial System include: order form, list of completed volumes, bindery order, accession register (for bound volume collection), current arrivals, classified and specialized indexes and lists of serials as required, budget & expenditure analysis, missing issues list, list of duplicate issues, notices for 'not received', 'overdue', 'soiled/damaged' issues, subscription

	<p>renewal order, new subscription order, claim letters for missing and non-supply, list of current subscription(alphabetical, department wise, publisher wise, vendor wise), and list of new titles added and deleted titles for particular year.</p> <p>General Specifications of Library Software</p> <ul style="list-style-type: none"> • Support unlimited data • LAN & WAN enabled client/ web server interface • Multi-user, user friendly and multilingual • ANSIZ39.50 Compliant • Full data transfer from present software including Indian language data • Extraction of record in any MARC-21 format • Imports/Export facility in ISO/2709 format • Circulation module with facility to scan member photo on membership card and online reservation, with features to check the status and history of each member online. • Union Catalogue with multiple access points • Multi-tasking with online help facility • Provision for customization of report • Financial management with different budget heads • Security of Access control as per categorization. • Articles indexing and scanning of articles • Should support image and multimedia files • Automatic currency conversion • Duplicate record check • Binding record management • Hyper linking of books • Status of user’s account from OPAC • Metadata (MARC-21/Dublin Core) • E-resource management (basic) • Use of preferred RDBMS such as Oracle/SQL Server/ MySQL / Progress SQL for databases and should be open, not locked to further generate any required report • Report on order/ budget status department wise • XML / CSV/Excel based interface for reports
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	<ul style="list-style-type: none"> • Windows® based, client server application • Unicode® standard • Flexibility to move from one language to another in all subsystems • Multiple search options available in OPAC • Multimedia access • Backup/ Restore/recovery of complete database • Comprehensive set of parameters to customize the software to meet the library's operational environment • Completely web/ browser based (works on internet/ intranet) • Supports windows / Windows NT/ Linux/ Unix
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2. Staff Station Reader

Item Name	Specifications
Staff station	<p>Library Staff Station Reader</p> <ul style="list-style-type: none"> • Support 13.56 Mhz. or better • Should be fully ISO/IEC 14443, 15693 and ISO 18000 compliant. • On the staff station library staff can do circulation and conversion (tagging). It physically consists of an RFID-antenna, a RFID-reader, a barcode scanner and a HKID-reader • The RFID antenna shall be fully shielded, i.e. not read items placed under the table and on the side of the antenna pad • The antenna pad shall be fabricated in transparent plexiglass with integrated LED's showing the transaction status • The staff station shall be able to program and verify multiple RFID tags put on the antenna • The staff station shall enable to have the tag security added or removed without interaction with the LMS • The RFID reader connects to the PC supplied by the library via keyboard wedge and accordingly simulate the connection of a barcode scanner

	<ul style="list-style-type: none"> • The staff station contains a communication link to an intranet based monitoring system and will cope with the requirements defined for that system. • The software delivered with the staff station shall handle both the RFID tagging of items and the circulation • SIP2/NCIP compliance software interface integrated with integrated library management software for all operations like patron card personalization, check-in. check-out, renew, reserve etc. of library circulation. <p>Dimensions (h x w x d):</p> <p style="padding-left: 40px;">Antenna: 13X9.5X0.4 inches or better Reader: 5.7X3.3X1.2 (inches) or better</p> <p>Weight: Antenna : 0.5 Kg Reader: 0.2 Kg or better</p> <p>Power/ Connectivity: RFID reader connects to PC via USB. The RF output is 1.2 watt or better</p> <p>RFID Specification: 13.56 Mhz or better</p> <p>Supported Tags types: ISO 15693, ISO 18000-3-A, (Infineon my-d, NXP I-Code, SLI, SLIx)</p> <p>Standard Compliance: Reader: CE and FCC regulations (certificate to be submitted)</p> <p>Circulation Software</p> <ul style="list-style-type: none"> • The circulation software shall be able to process tags programmed in more than 30 different data models • Staff can select a method for writing security; on, off, none, auto, etc. • Provides complete ISO 28560 compliancy • It shall be possible to work both with single items and multiple items • As option the staff station might connect to the library management system using their web based services. This requires an integration with Library Management System. • It shall work with more than 30 different data models on the labels • It shall provide support for more than 100 languages • It shall warn staff if a library item potentially has parts missing • It shall be designed to work so that in normal operations the
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	<p>staff simply needs to 1) Place item(s) on pad 2). Wait for security colour to change 3). When security write colour changes back simply remove stack.</p> <p>Tagging Software</p> <ul style="list-style-type: none"> • The tagging software provides staff with a quick and easy way to tag and convert stock items, taking around five seconds physical time per item to complete. • Does not require any communication with the LMS, staff can carry out the conversion process any location in the library • If a tag cannot be written for whatever reason, then the system will detect this and inform correspondingly • Must support more than 30 different data models and more than 20 extended fields • If the bar code input does not match a particular length or mask (due to scanner or user error) a warning can popup to prevent writing the tag with a potentially bad value <p>Desktop Computer</p> <ul style="list-style-type: none"> • Core i5 Processor or higher • 8GB RAM or higher • 1 TB HDD or higher • 22 Inch Monitor or higher • Windows 8 license OS or latest OS
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3. Gate Antenna Security System

Item Name	Specifications
RFID GATE security system	<p>General Specification</p> <ul style="list-style-type: none"> • The gates shall be fabricated in solid • It shall detect RFID label on which security is set on • External devices, such as CCTV and/or barriers can be connected • Alarms are generated the entire gate in a red light combined with an adjustable audible alarm. • Light alarm can be optionally generated by all the pedestals or just by the 2 pedestals the library item was detected • It shall provide full detection from 0 to 35 inches/900 mm • It shall obtain optimal detection performance at a pedestal

	<p>distance of 900mm</p> <ul style="list-style-type: none"> • It shall be built on a master – slave principle with up to 8 pedestals in one single system • All electronic, i.e. readers, multiplexers are built into the pedestals, there are no external devices • The gate supports multiple RFID data encoding models simultaneously • The gate support latest technology i.e. AFI <p>Gate Software</p> <ul style="list-style-type: none"> • The gate software is installed on a PC supplied by the library running with Windows XP or Windows 7 • The said PC is connected to the gates via physical LAN connection • Different clusters of gates can be logically connected to the same PC • Clusters of gates can be given nick names • The screen displays the ID (barcode) and title of items generating an alarm, the exact time and the pedestal ID • The gate software contains a communication link to an intranet based monitoring system and will cope with the requirements defined for that system. <p>Dimensions (w X d X h): 80 X 720 X 1590 (+/- 3) mm or better Weight: 54 kgs or equivalent RFID Specification: 13.56 Mhz or better Max Transmitting Power: 4W or better Supported Tags types: ISO 15693, ISO 18000-3-A, (Infineon my-d, NXP I-Code, SLI, SLIx) Standard Compliance: CE, C-Tick, ARIB, ETSI, FCC, IC, ADA, DDA, UL</p>
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4. RFID Handheld Reader

Item Name	Specifications
HF Handheld Inventory System	<p>Handheld Portable Reader</p> <ul style="list-style-type: none"> • Ergonomically designed Cordless PDA based Wi-Fi Handheld Inventory Reader + external Antenna integrated with chargeable battery (minimum 4 Hours life or better). • The proposed system shall be fully compliant with ISO 15693/ISO

	<ul style="list-style-type: none"> • 18000-3 Mode-1 standards & supplied tags. • Software Components: Client software for PDA. Also supply of compatible software for laptop & PC. • Features: Long lightweight handheld; performs stock-checking, re-shelving and also locates specific items, sorting and monitoring of library material on shelf along with locating misplaced documents. To locate items that is misplaced on the shelves. • Reading 15-20 items per second or better • Certification: CE/EN, ETS, FCC, UL, EMC, etc. • Long wand / extended reach for taking stock taking and searching for book above the racks without using any secondary hardware/furniture. • Display lost and misplaced items in the shelves. • If any middleware software is required for integrating with the whole system, it must be supplied along with hand held reader. <p>Dimensions (w X d X h): Reader 19X11X6 cms, Antenna : 60 cms</p> <p>Weight: Reader: 0.7 Kg Antenna : 0.3 Kg</p> <p>RFID Specification: 13.56 Mhz</p> <p>Battery Life: 4 hours or more with one backup battery</p> <p>Power: DC Power 12 V DC 2,500 mAh</p> <p>RF Output Power: 1.2 W Typical</p> <p>Power Consumption: 4.5 W</p> <p>Display PC: Window 7/8</p> <p>Supported Tags types: ISO 15693, ISO 18000-3-A, (Infineon my-d, NXP I-Code, SLI, SLIx)</p> <p>Standard Compliance: CE, FCC Part 15, ETSI EN300-330 (EM Emission) EN 50364 (Human Exposure) (certificate to be submitted)</p> <p>Software for Handheld Reader</p> <ul style="list-style-type: none"> • The staff shall use a light-weight, portable, handheld terminal with colour touch-screen, battery and flexible antenna on a rotation axis which provides library staff a quick, effective and
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	<p>reliable mechanism to interrogate the library shelf.</p> <ul style="list-style-type: none">• The terminal shall work off-line. Connection to the library management system shall take place via an intermediate PC with which the handheld shall communicate using Bluetooth or USB-cable.• The intermediate PC is supplied by the library and works with Windows XP or Windows 7 or Windows 8 or higher (latest)• The terminal can perform an instantaneous inventory of all on-shelf items by reading the RFID tagged items. Following an inventory, data can be uploaded to the LMS or analyzed manually.• The terminal features a large flexible antenna that is designed to flex around the books as it is moved down the shelf edge.• An all-in-one touchscreen device with full navigation capabilities displays information relating to the current task, with notifications provided optionally, via audible alerts or LED light.• The terminal incorporates an additional barcode scanner for alternative reading of items• The terminal incorporates a full keyboard so that data may also be added manually.• The terminal provides an effective read range of 300mm, combined with a scanning rate of 400-600mm of library shelving per minute of use• The terminal can gather data into a file that may be imported into the library management system that supports inventory import. This allows the portable data gathering device and software to be able to output data that the staff can use for inventory reporting within the library management system.• The terminal can import text files from numerous formats to use as 'search' records. The data gathering device and software to find any items such as holds, or items presumed missing if such lists can be exported from the LMS or manually created in a text document.• Can find items significantly out of range if an ordered text file is imported
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	<ul style="list-style-type: none"> The stock taking terminal contains a communication link to an intranet based monitoring system and will cope with the requirements defined for that system.
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5. RFID Tags

Item Name	Specifications
RFID tag	<p>The RFID chip used in the tag should have been designed specifically for library use. It should have:</p> <ul style="list-style-type: none"> Standards: ISO 18000–3, ISO 15693, ISO 28560-1, CE Total memory: 1024 bit / 32 blocks or better IC Write Endurance: 100,000 Operations or better Operating Frequency: 13.56 MHz or better Performance guarantee and capability to provide over 100,000 read/write operations or better NXP ICODE SLIX processor or better Aluminium antenna 32 bit password protection or better Data Retention: 50 Years or better Footprint 86mm x 54mm or better Recommended to use for books, magazine, CD covers etc.

6. RFID Member Card

Item Name	Specifications
Member Card	<p>RFID Member Card</p> <ul style="list-style-type: none"> Memory- 1 KB or more and as per the requirement ISO Card (Blank - White - Credit Card Size) NXP S50 Chip R/W 1K Bytes

7. RFID Middleware Software (centralized Control System / Software for all RFID hardware/device)

Item Name	Specifications
RFID Middleware Software (centralized Control System /	Centralized control/administrative software for all the RFID hardware must be a web based application. Vendor should be able to provide the support online by monitoring the health / condition of the RFID

<p>Software for all RFID hardware)</p>	<p>hardware.</p> <ul style="list-style-type: none"> • The control system shall connect via the library intranet to all RFID-enabled equipment delivered by the supplier • The control system shall be hosted by the supplier • All network communication shall be secured through https connections (SSL security certificate). • The system shall allow for individual configurable access rights. Login takes place with username and password. Certified library staff users shall be able to manage different security groups and give access rights • There is no limitation on the number of library staff users that can get access rights. • One shall have the possibility to dedicate certain cluster of branches to certain users or certain types of equipment to certain users • The control system typically gives access to a specific library within the library network, a specific device inside that library and specific component inside that device • The control system shall be able to receive event- and errors messages from devices, i.e. when a sorting bin is full or not present; a paper roll is almost finished etc. • The control system shall enable users to look at the current status of devices and their main components and make diagnostics. • The control system shall provide statistics of utilization, i.e. transactions per time unit, whereby the time intervals can be set. The statics can be exported into various standard formats. • The control system shall enable the certified user to change the configuration of devices - and set the time for concurrent downloading of updated software to all devices within the library network. • The control system shall enable the certified users to monitor the function of sorting systems with the physical installation modeled on the screen
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	<ul style="list-style-type: none"> • Data shall be cached on all devices before being uploaded to the control system. This allows data to be held indefinitely in the event of a communication failure and then sent when communication can be re-established. • The control system can email or send SMS text alerts to defined users when a device reports a part in a state the user is interested in. This means that users do not need to be constantly logged in for the system to alert them of a problem. Alerts can be instant repeatable or issued once per day • The control system shall allow device configuration to be changed from a single source and then deployed without needing to visit that device to update configuration locally • The control system shall give the feature of combining statistical information from many devices to provide a holistic view of patron interactions with devices within the library.
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8. Self Check out Kiosk

Item Name	Specifications
Self-Check Out System	<p>Desktop based self-checkout system for the issue and return of library resources integrated with library management software via SIP2 protocol.</p> <ul style="list-style-type: none"> • Non-intrusive look i.e. can be easily blend with library interior. • Capable of issue and return of library books with RFID tags • Can easily be upgraded to provide full range of media case unlocking capabilities and the ability to collect fines and fees • Reduce repetitive strain injuries. • Easy-to-use interface makes self-checkout fast and simple • Can be upgraded to pay their fines and fees right at the kiosk with the swipe of a credit/debit card • Should be integrated with library management software with SIP2 protocol • Should also support barcode based circulation also. • Built in graphic capable thermal receipt printer, provides the users with a complete simple statement of items that are

	<p>currently on their account.</p> <p>Hardware Specification</p> <ul style="list-style-type: none"> • Dimensions (w X d X h) : 22 X 21 X 23.25 inches or better • Weight : 20 kg (with 17” touchscreen) or better • Power: 110-230 V 50-60Hz, IEC inlet Socket, 5 Amp supply • Data: RJ45 socket for Ethernet network connectivity • Touchscreen: 17” inches or better • Login types: barcode (full range of barcode type), RFID, smartcard and manual screen entry • Standard and Compliance: DDA, ADA, CE, FCC • Reporting: configuration and reporting is made available in real-time via Centralized Control System/Software for all RFID hardware. <p>Self-service kiosk software</p> <ul style="list-style-type: none"> • The software shall run under Windows XP and Windows 7 • The software shall enable checking library items in and out based on a SIP2 connection to the library management system • The software shall enable patrons to check their account (items borrowed and expiration per item, fees and fines) and to prolong (if the library choose to allow for it) • When processing library items (checking in-or out) the status of each item shall be displayed ((incl. the setting of the security bit and type of item (i.e. books, CD, DVD’s, Blu-ray and games) • The software shall allow to integrate payment functionality at a later stage (cash (coins & notes) and chip & pin cards, without software charges. • The software shall allow the library to choose between several standard theme designs, also children’s themes. • The software shall allow the library to optional chose a customized theme • The screen can display more than 10 languages that patrons can chose from for communication • The software allows the patron to switch language whenever
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	<p>he/she wants to – also in the middle of a check-in / check-out session</p> <ul style="list-style-type: none"> • The software enables a patron to complete all functions (check in, check out, check account, payments) under one login, making the transaction process easy and smooth. • The software shall have the ability to provide access to any external web-based system via a simple configuration. The external system can be accessed via an on-screen buttons which is easily configurable. The software shall also have the possibility to handle PC booking and print management facilities via integration with a 3rd party supplier. • The software can be configured to continue working in offline mode, when the connection to the LMS has failed. The software shall continue to let patrons borrow and return items to provide a continuous service; then once the connection to the LMS has been restored, all offline transactions shall be automatically uploaded to the LMS ensuring that all transaction history has been updated. If transactions fail to upload correctly then the staff will be alerted automatically • The software contains a communication link to an intranet based monitoring system and will cope with the requirements defined for that system. <p>Desktop Computer</p> <ul style="list-style-type: none"> • Core i5 Processor or higher • 8GB RAM or higher • 1 TB HDD or higher • 22 Inch Monitor or higher • Windows 8 license OS or latest OS
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9. Book Drop Station

Item Name	Specifications
Book Drop System	<p>Desktop based Book Drop system for the issue and return of library resources integrated with library management software via SIP2 protocol.</p> <ul style="list-style-type: none"> • Non-intrusive look i.e. can be easily blend with library interior. • Capable of return of library books with RFID tags • Can easily be upgraded to provide full range of media case unlocking capabilities and the ability to collect fines and fees • Reduce repetitive strain injuries. • Easy-to-use interface makes self-checkout fast and simple • Can be upgraded to pay their fines and fees right at the kiosk with the swipe of a credit/debit card • Should be integrated with library management software with SIP2 protocol • Should also support barcode based circulation also. • Built in graphic capable thermal receipt printer, provides the users with a complete simple statement of items that are currently on their account. <p>Hardware Specification</p> <ul style="list-style-type: none"> • Reader Dimensions (w X d X h) : 22 X 21 X 23.25 inches • Weight : 20 kg (with 17" touchscreen) or equivalent • Power: 110-230 V 50-60Hz, IEC inlet Socket, 5 Amp supply • Data: RJ45 socket for Ethernet network connectivity • Touchscreen: 17" inches or equivalent • Book Drop Enclosure with receiving cart • Login types: barcode (full range of barcode type), RFID, smartcard and manual screen entry • Standard and Compliance: DDA, ADA, CE, FCC • Reporting: configuration and reporting is made available in real-time via Centralized Control System/Software for all RFID hardware. <p>Desktop Computer</p> <ul style="list-style-type: none"> • Core i5 Processor or higher

	<ul style="list-style-type: none"> • 8GB RAM or higher • 1 TB HDD or higher • 22 Inch Monitor or higher • Windows 8 license OS or latest OS <p>Book Drop software</p> <ul style="list-style-type: none"> • The software shall run under Windows XP and Windows 7/8 or latest. • The software shall enable checking library items in and out based on a SIP2 connection to the library management system • The software shall enable patrons to check their account (items borrowed and expiration per item, fees and fines) and to prolong (if the library choose to allow for it) • When processing library items (checking in-or out) the status of each item shall be displayed ((incl. the setting of the security bit and type of item (i.e. books, CD, DVD’s, Blu-ray and games) • The software shall allow to integrate payment functionality at a later stage (cash (coins & notes) and chip & pin cards, without software charges. • The software shall allow the library to choose between several standard theme designs, also children’s themes. • The software shall allow the library to optional chose a customized theme • The screen can display more than 10 languages that patrons can chose from for communication • The software allows the patron to switch language whenever he/she wants to – also in the middle of a check-in / check-out session • The software enables a patron to complete all functions (check in, check out, check account, payments) under one login, making the transaction process easy and smooth. • The software shall have the ability to provide access to any external web-based system via a simple configuration. The
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	<p>external system can be accessed via an on-screen buttons which is easily configurable. The software shall also have the possibility to handle PC booking and print management facilities via integration with a 3rd party supplier.</p> <ul style="list-style-type: none"> • The software can be configured to continue working in offline mode, when the connection to the LMS has failed. The software shall continue to let patrons borrow and return items to provide a continuous service; then once the connection to the LMS has been restored, all offline transactions shall be automatically uploaded to the LMS ensuring that all transaction history has been updated. If transactions fail to upload correctly then the staff will be alerted automatically • The software contains a communication link to an intranet based monitoring system and will cope with the requirements defined for that system.
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10. Member Card Printer

Item Name	Specifications
Card Printer	Thermal transfer, 300 dpi, Color double-sided printing at 125 cards/hour, 2.125" card width, USB interface, 16MB RAM. Including Printer, Power cord, USB cable, card Design software.

11. Server Hardware Configuration

	Make	HP/Dell/IBM
1	Server Model	Server Model with below specification with redundant enablement kit and all the accessories etc. complete in all respect
2	Processor type	Intel Xeon Processor E5-2609 v3 (1.9 GHz/6-core/95W/15MB) or Superior
3	Number of processors	2 Processor or superior
4	Standard memory	16 GB (8x2) or higher
5	Internal hard disk drive	Minimum 3 nos. 300 GB 6G SAS or higher

6	Hard disk controller	Smart Array P420/1GB FBWC Controller or higher
7	Internal drive bays	hot plug advanced key (RAID Technology)
8	Optical drives	OEM SATA DVD+/- RW Drive
9	Power Supply	Redundant power supply (provide additional power supply kit for power redundancy)
10	Network interface	Embedded Dual Port Gigabit Server Adopter
11	Keyboard & Mouse	OEM standard keyboard and mouse
12	Monitor	OEM standard 18.5"
13	Compatible operating systems	Microsoft® Windows® Server 2012 and Linux Operating System (Latest)
14	Warranty	Five years onsite comprehensive maintenance including labour & parts shall be provided through Manufacturer Warranty/Care Pack/Support Pack.

Annexure-E**List of approved makes for IT Work**

Sr. No.	ITEM	MAKE
1.	Core Switch	HP/Cisco/Juniper/Brocade
2.	Access Switch	HP/Cisco/Juniper/Brocade
3.	Network Management Solution	HP/Cisco/Juniper/Brocade
4.	Wireless Access Controller	Cisco/Ruckus/Aruba
5.	Wireless Access Point	Cisco/Ruckus/Aruba
6.	Firewall	Fortinet/Sophos/Cisco/Checkpoint/ Palo Alto
7.	U/FTP Components(Passive devices for LAN)- Cat 6A U/FTP, Wall Plate 1 Port/2 Port, Power Cat6A DataGate Jack, Cat 6A Patch Cord S/FTP,GANG Box, 24 Port Patch Panel CAT-6A	Molex / Systemax / Panduit / AMP/ R&M
8.	Optical Fibre Cable components (Passive devices for LAN)- 12 port MM/SM SC LIU Fibre Panel, SC Pigtail SM/MM, SC-LC Multimode/SinglemodePatchcord,6 core SM OS1 cable, 6 core MM OM3 cable	Molex / Systemax / Panduit / AMP/ R&M
9.	Server Hardware	HP/Dell
10.	Network Rack	Valrack/Rittal/Netrack
11.	PACS Workstation	HP/Dell
12.	PACS Workstation Monitor (Display)	Barco or equivalent
13.	Desktop, Notebook PC& Thin Client	HP/Dell
14.	Tablet	HP/Dell/Samsung
15.	Printer & Scanner	HP/Ricoh
16.	UPS System	APC/Eaton Power ware/Emerson/Schneider
	UPS Battery	Panasonic/Hitachi/Cummins/Exide