

**TENDER DOCUMENTS FOR THE SETTING UP OF CLINICAL
LAB AND SCANNING CENTRE AT SEC 39, GURGAON,
HARYANA.**

Tender No. HLL/CHO/HCS/PROJ/2016-17/08 dated 19-09-2016



**HLL LIFECARE Ltd.
CORPORATE AND REGD. OFFICE
HLL BHAVAN, POOJAPPURA
THIRUVANANTHAPURAM
0471-2354949, Ext. 331,325,326,289.**

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HLL Lifecare Limited

(A Government of India Enterprise)

Corporate and Regd. Office: HLL Bhavan, Poojappura , Thiruvananthapuram-695012, Kerala, India.

Ph: 0471-2354949, Ext. 331,325,326,289.

Dated:19-09-2016

NOTICE INVITING TENDER

Sealed item rate tenders are invited in single cover system from Contractors or agencies who have executed similar works in nature and magnitude for the following works to be carried out at HLL Life Care Limited.

NIT No. & Name of Work	EMD	Period of Completion	Publishing Date	Date of	
				Last submission	Opening of technical bid
(i) HLL/CHO/HCS/PROJ/2016-17/08 "SETTING UP OF CLINICAL LAB AND SCANNING CENTRE AT SEC 39, GURGAON, HARYANA".	₹. 3,80,000.00	45 days	19-09-2016	05-10-2016 upto 11.00 hrs	05-10-2016 on 14.00 hrs

Notes:

- Contractors who should have minimum five years experience in executing similar works and magnitude of minimum Rs.1.00 crore during the last five years alone are eligible to apply. They should furnish the details of similar works executed by them as per the eligibility criteria.
- Tender documents can be downloaded from the HLL web site www.lifecarehll.com from 19-09-2016 onwards.
- Tenders should be submitted in cloth lined cover super scribing the name of work, NIT number and name of Tenderer. Tenders without EMD will be summarily rejected.
- HLL Lifecare Limited, reserves the right to reject any or all tenders without assigning any reason thereof.
- Further details can be had from the website of HLL Lifecare Limited (or) Office of the AVP&BH, HCS Division, Corporate Head Office, HLL Bhavan, Poojappura , Thiruvananthapuram-695012, Kerala.

AVP&BH , HCS ,HLL Lifecare Limited

GENERAL TERMS & CONDITIONS

1. Eligibility criteria:

The bidders should satisfy the following eligibility criteria :

Eligibility Criteria	Documentary proof for eligibility (all copies should be self attested)
a. The prospective bidder should have minimum five years experience in executing similar works.	Copies of work orders shall be produced
b. The bidder should have completed at least three works each having value of minimum Rs.1.00 crore during the last five years.	Copies of work orders and completion certificates issued by the authority concerned shall be submitted. Completion certificates for works issued by private parties shall be supported by TDS certificates
c. The bidder shall possess valid Electrical Contractor's license of appropriate class and category issued by Central or State Electric authority.	Copy of the valid electrical license shall be submitted.

Earnest money of Rs.3,80,000/- (Rupees Three Lakh Eighty Thousand Only) in the form of a Demand Draft taken from a scheduled bank, payable at Thiruvananthapuram, Kerala issued in favor of **HLL Lifecare LTD, HLL Bhavan, Poojappura, Thiruvananthapuram** which should be placed in a separate sealed cover marked **“Earnest Money Deposit”** shall be submitted along with the tender. EMD of the unsuccessful bidders will be returned without any interest within 15days from the date of issue of work order. The EMD of the successful bidder will be converted into security deposit / retention money. The E.M.D. may be forfeited, If a bidder withdraws his bid during the period of validity specified or If the successful bidder fails within the time limit to sign the contract document or fails to furnish the required security deposit.

2. Submission of Bid:

The bids should submit as two bid system . Techno-Commercial bid and Price bid as per the instructions given below.

Envelope -1(EMD)

The envelope-1 should contain the following:

EMD in the prescribed format, in the envelope super-scribed “Earnest Money Deposit”. (Name & address of the firm should be mentioned on the reverse side of the draft with pencil.)

Envelope -2 (Techno-Commercial bid)

The Techno-Commercial Bid in separate envelope should contain the followings:

- i. Acknowledgement in prescribed format along with duly signed copy of tender document in all pages.(Annexure -A)
- ii. Documental proof for the eligibility criteria as specified in clause no.1 of general terms and conditions
- iii. Name of the Firm, Business address of the firm, Telephone No, Mobile No, Email ID etc., along with details of constitution of the company. (Proprietary / Limited etc. with details), along with the latest company profile.
- iv. Attested Copies of certificates of Registration of firm, PAN No. and VAT Registration with concerned authorities.
- v. Attested copy of EPF Registration.
- vi. Balance sheet - for years 2015 -16, 2014-15 and 2013-14 and profit and loss statement.
- vii. Construction Program chart in the form of a bar chart on MS Project, etc.
- viii.Plant, Machinery and Tools proposed to be deployed for the work.
- ix. Manpower deployment schedule
- x. List and Names of Sub-Contractors if any, proposed to be deployed for the various items of work comprising the tender, along with brief profiles / resumes of the sub-contractors and their period of association with the tenderer.
- xi. List of similar works executed in the recent past together with Client details, Contract amount, Original Contract Period & Actual Completion Period, Principal reasons for delay, if any. (HLL reserves a right to make a reference to the Customer if he so deems fit.)
- xii. Litigation history of the agency is required to be submitted along with the techno-commercial bid.

All the above documents should be self attested by the bidder or the Authorized representative. The Performa for the above particulars is annexed herewith.

The bids shall not be considered if any inquiry proceedings/ court cases is/are found pending against the bidder.

Envelope - 3(Price Bid)

The price bid shall consist of the Schedule of items, rates and amount duly filled in the manner specified in the tender schedule and duly signed on all pages.

The Financial Bids in separate envelope should be strictly as per the format given in the Annexure-II of tender document. The rates quoted in the Financial Bids should be both in words and figures. In case of any discrepancy, the rates quoted by contractor in words shall be taken as correct.

Bids with any scoring-off or overwriting in figures will not be considered. The financial bid should be properly sealed and signed.

Financial bids of only those firms will be opened, who qualify on the basis of the Technical Evaluation by the Tender Committee.

The Technical and Financial Bids and EMD draft should be put in three separate envelopes super-scribed as '**TECHNICAL BID**', '**FINANCIAL BID**' and '**Earnest Money Deposit**' respectively, and sealed separately. Three of these envelopes should be put in a bigger envelope super-scribed as "**Tender for SETTING UP OF CLINICAL LAB AND SCANNING CENTRE AT SECTOR 39, GURGAON, HARYANA**"

The filled & duly signed bid should be submitted to **Associate Vice President & Business Head (HCS), Healthcare Service Division, HLL Lifecare Limited, HLL Bhavan, Poojappura, Thiruvananthapuram, Kerala . Pin:695012. PH- 0471-2354949** on or before 05-10-2016 by 11.00 Hrs. The application shall be clearly marked as "**Tender for the CONSTRUCTION OF CLINICAL LAB AND SCANNING CENTRE AT SECTOR- 39, GURGAON, HARYANA**"

The Technical bids of the tenderers will be opened at 14.00 Hrs on 05-10-2016 in the presence of interested bidders or their authorized representatives who choose to attend at the time of opening of tender.

The date and time for opening of the price bids will be intimated later on .Price Bids will be opened only for the bidders, whose Technical Bids have been found to be acceptable.

3. The work shall be completed within 45 days After 7 days from the date of receipt of Work Order or LOI.
4. A formal contract agreement on non-judicial stamp paper of Rs.200/- will be drawn up (cost to be borne by the contractor) and the successful bidders are requested to attend the office of the Associate Vice President & Business Head (HCS), Healthcare Service Division, HLL Life care Limited, HLL Bhavan, Poojappura, Thiruvananthapuram, Kerala. with the stamp paper for entering into an agreement within 7 days from the receipt of this work order.
5. The Contractors whose tender is accepted will be required to furnish Performance Guarantee and Security Deposit / retention money (including the Earnest Money Deposits/s) for the due fulfillment of the contract/s at the following rates.
 - (i) 5% of the work order value of the work as performance guarantee, should be submitted within 7 days of issue of the letter of acceptance in the form of Bankers Cheque / Demand Draft / fixed Deposits receipt of a Scheduled Bank, an irrevocable bank guarantee of any nationalized bank in the prescribed form. Performance guarantee will be released within 15 days from the satisfactory completion of the work / after the issue of the completion certificate .
 - (ii) A sum of 5% of the gross amount of the bill shall be deducted from each running bill of the contractor. Such deductions shall be made unless the contractor has deposited the amount of security in cash or Fixed Deposit Receipt. This is in addition to 5% performance guarantee the Contractor is required to deposit as (i) above.
6. Retention Money and Defect liability period: Retention money / Security deposit will be released only after the satisfactory completion of the defect liability period which is one year from the date of issue of Work Completion Certificate.
7. The tender for the work shall remain open for acceptance for a period of 90 days from the date of opening of tender.
8. The contractor shall visit the site before quoting the rates and clarifications if any required can be had from the address mentioned above.

9. Rates quoted should be inclusive of all cost of materials, Tools/Equipments labor charges, conveyance to site, handling charges, loading and unloading charges, hiring charges, clearing of debris, statutory payments etc.
10. The HLL Lifecare Ltd. reserves all the right to accept or reject the Tender either partially or fully without assigning any reason what so ever.
11. The work should be carried out without causing any inconvenience to the public and shall ensure that no damages are caused to the existing site premises.
12. During the execution of work the contractor or his authorized representative/s should be present at the site and the work shall be executed under the supervision of adequate number of persons having technical qualification and sound knowledge of the works.
13. All Materials, Equipments/ Tools required for the work should be arranged by the contractor and brought to site for the timely completion of the work.
14. The materials used shall be as per specification, of good quality and got approved by the concerned engineer-in-charge.
15. The Contractor has to arrange necessary insurance coverage for the machine, workmen etc. deployed by him. He shall arrange all safety measures to protect his workmen and also the properties of HLL & Client.
16. WATER AND ELECTRICITY : The contractor shall make his own arrangement for water and electricity required for the works. HLL will not be responsible for the supply of either electricity or water.
17. This document will form part of the tender document and the agreement executed by the successful tenderer.
18. The work site safety of all employees, their ESI, PF etc will have to be borne by the contractor.
19. Taxes & Duties: The amounts quoted in the tender shall be inclusive of all taxes and duties.
20. Penalty for delay: Penalty shall be imposed at 0.5% per week to a maximum of 7.5% of the contract value for any delay committed by the contractor in completing the work as per the order.

- 21. Measurement & Payment terms:** The method of measurement of completed work shall be in accordance with the standard measurement. Payment will be made on satisfactory completion of work as per the order. Interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements in the format of HLL. All such interim payments shall be regarded as payment by way of advances against final payment only, and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re erected. Any certificate given by the officer relating to the work done or materials delivered forming part of such payment, may be modified, or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or material so which it relates is /are in accordance with the contract and certificate. Any such interim payment/any part thereof shall not in any respect conclude, determine or affect in any way powers of the engineer in charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.
- 22. Payment Schedule:** The contractor can submit Running account bills during the work period only when the amount comes at least 20% of the work order value. The running account bills are to be submitted detailing the work description ,quantity and rate as per the Work Order. Payments for running bills, etc, will be made after effecting the statutory deductions of TDS, Work Contract Tax, Service Tax (reverse charge), etc . Retention money / Security deposit will be deducted on each bill as per clause 5(ii). The final bill shall be paid only after issue of Work Completion Certificate by Engineer In Charge/Officer In Charge of HLL Life care Ltd .
- 23. The Quantity shown in the schedule is an approximate estimated quantity. No rate revision will be entertained if the quantity increases/decreases due to the site condition while executing the work.**
- 24. The Contractor may require to execute certain extra items of work required for the satisfactory completion of work. The extra items shall be executed only based on direction of Engineer in charge / Officer in charge after obtaining the written approvals. The payment of extra item will be worked out at market rates prevailing at the time of commencement of execution of these items. For any**

substituted items, the agreement rate of the original item will be adjusted for the difference in market rates of original and substituted items

25. Settlement of Dispute: Arbitration shall not be the means of settlement of dispute or claims or anything on account of this Contract. If any disputes and difference arising out of the contract are to be settled by a civil court at Thiruvananthapuram.

For HLL Lifecare Ltd.

Associate Vice President and Business Head (HCS)

SPECIAL CONDITIONS ;CIVIL WORKS & PH

The works to be governed by this contract shall cover delivery and transportation up to destination, safe custody at site, insurance, erection, testing and commissioning of the entire works.

Some restrictions may be imposed by the security staff etc. on the working and for movement of labour, materials etc. The contractor shall be bound to follow all such restrictions/instructions and nothing extra shall be payable on account of the same.

The works shall be carried out in the manner complying in all respects with the requirements of the relevant bylaws and regulations of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and nothing extra shall be paid on this account.

The specifications/technical parameters mentioned in the bid document is a minimum requirement. The bidder may quote for any equivalent or updated technology and shall mention the same clearly. However the no preference shall be given while selecting L1 bidder in lieu of any updated technology/ enhancements proposed.

The work shall be executed and measured in metric units given in the schedule of quantities, drawings, etc., (FPS unit wherever given is for guidance only).

Coarse sand shall be obtained from sources to be got approved by the Engineer-in-Charge. Whenever required, the coarse sand shall be screened and washed to suit the requirement of the specification. Nothing extra shall be payable on this account.

The rates for all items, unless clearly specified otherwise shall include all inputs of materials, labour, T & P, taxes, duties, scaffolding, wastages, profit, overhead, watch & ward, all incidental charges and shall also cover all obligations of the Contract.

Care shall be taken to avoid or reduce to the absolute minimum any cutting and demolishing of masonry work constructed to carry services pipes etc. Where pipes are encased in the hollows of double walls the outer wall shall be constructed after the piping or conduit works are complete in all respects and tested. In case it is found absolutely necessary to cut for taking any services, the same shall be made good during finishing to the satisfaction of the Engineer without any extra payment.

All works shall be carried out as per the specification given in this document. Wherever wanting corresponding CPWD specification shall be followed.

If any work is not covered in technical specification given in this document and CPWD specification, the same shall be carried out as per Manufacturer Specification and as per best Engineering Practice.

The engineer reserves the right to select any of the brands indicated in the list of approved makes. the tenderer shall quote his rates on the basis of the price of best quality product of the brand/make stipulated in the item of works as described in boq & specification as well as in the list of approved make. The contractor cannot claim anything extra if the client changes the make but within the list of approved make.

LIST OF APPROVED MAKES (Civil)

***NOTE:** THE CONTRACTOR SHALL QUOTE HIS RATES ON THE BASIS OF THE PRICE OF BEST QUALITY PRODUCT OF THE BRAND / MAKE. IN CASE ANY PARTICULAR BRAND OF ITEM IS NOT ACCEPTABLE TO THE CLIENT, THE CONTRACTOR SHALL SUPPLY ITEMS OF OTHER APPROVED BRANDS AT NO EXTRA COST.*

SL. No.	MATERIAL	MAKES / MANUFACTURER
A	CIVIL WORKS	
1	ANTI - TERMITE TREATMENT	OSOLIN, OR EQUIVALENT AGENCIES.
2	CONCRETE ADDITIVE	SIKA/STP/CICOTECHLTD/PIDILITE/FOSROC/FAIRMATE/MC BOUCHEMIE/ CHOKESY
3	HEAT REFLECTIVE GLASS	GLAVERBEL/ ASAHI INDIA / SAINT GOBAIN/
4	ADHESIVE FOR DOOR WORK	FEVICOL/VAMICOL/DUNLOP

5	DASH FASTENERS		HILTI/ FAISCHER/ BOSCH
6	DOOR LOCKS		GODREJ/ HARRISON/ LINK
7	ALUMINIUM DOORS & WINDOWS FIXTURES/ FITTING		EVERLITE / ARGENT/ CLASSIC/ CROWN/ EARL BIHARI
8	EXTRUDED POLYSTYRENE BOARD		STYROFOAM BY DOW CHEMICALS/ INSUBOARD BY SUPREME INDUS RIES
9	BITUMASTIC FIBRE BOARD		SHALIMAR TAR PRODUCT/FOSROC
10	EXPANSION JOINT SYSTEM		HERCULES / J. SONS
11	FIRE DOORS		NAVAIR/ SHAKTI - MET DOR/ GODREJ
12	FLUSH DOOR SHUTTERS		DURO/GREENPLY/CENTURY
13	STAINLESS STEEL HARDWARE		ARKAY/ GODREJ/ D-LINE/ CARL-F
14	LAMINATES		DURO/ CENTURY/ GREENLAM/ FORMICA/ DECOLAM/ EURO
15	PLYWOOD/ BLOCKBOARD/ PLY BOARD		DURO/ GREENPLY/CENTURY/ KITPLY/ GREENLAM/ NOVAPAN/ MARRINO/ GREENPLY/ EURO

16	PRE- LAMINATED PARTICLE BOARD		ANCHOR/ NOVAPAN/ CENTURY/ GREEN PLY/ARCHIDPLY
17	PVC CONTINUOUS FILLET FOR PERIPHERY PACKING OF GLAZINGS/ STRUCTURAL/ GLAZINGS		ROOP/ ANAND/ FOREX PLASTIC/ NAGALIA/ TRADING COMPANY
18	STAINLESS STEEL BOLTS, WASHERS, NUTS & SCREWS		KUNDAN/ PUJA/ ATULI
19	STAINLESS STEEL FRICTION/SPRING HINGES		EARL BIHARI/ SECURISTYLE/ EBCO /ARKAY
20	M.S. PIPE		JINDAL/ PRAKASH- SURYA/ KALINGA/ TATA / TT SWASTIK
21	CERAMIC TILES		JOHNSON/ SOMANY/ KAJARIA/ SPARTEK/ NITCO/ ORIENT/ BELL CERAMICS
22	CERAMIC TILES ADHESIVE		CICO TECH LTD / BELL/ PIDILITE/BAL ENDURA/ BASF/SIKA/FAIR MATE
23	COMPRESSED CHEQUERED TILES		JOHNSON/ SOMANY/ KAJARIA/ SPARTEK/ NITCO/ ORIENT/ BELL CERAMICS

24	VACUUM DEWATERED FLOORING		TREMIX/ SUN BUILD/ AVCON TECHNICS
25	VITRIFIED TILES		NITCO/ NAVEEN/ BELL/ H.R. JOHNSON/ KAJARIA/ SOMANY / EURO
26	CARPET FLOORING		HERITAGE/KANAK
27	THERMAL INSULATION/ROCKWOOL/MINERAL WOOL/PUF		M/S LLOYD INSULATIONS INDIA LTD./ MALARPUR ENTECH/ARMACELL
28	WATERPROOFING AGENCIES/ MATERIAL		SHALIMAR TAR PRODUCTS/ IWL (INDIA) LTD. / LLYOD INSULATIONS INDIA LTD. / CHEMISOL ADHESIVE PVT. LTD. MUMBAI/ INDIAN WATER PROOFING /OVERSEAS WATER PROOFING/ (CHEMISTIK) TEXAS LTD/ FOSROC /SIKA / CICO TECH LTD/ MC BOUCHEME
29	METAL SHEET ROOFING		M/S LLOYD INSULATIONS INDIA LTD./ M/S KIRBY
23	DRY DISTEMPER		PAINTS ETC SHALL BE FIRST QUALITY OF ICI, BERGER, ASIAN, SHALIMAR, NAROLAC AND JOHNSON &
31	DISTEMPER/ACRYLIC WASHABLE DISTEMPER		
32	OTHER PAINTS/ PRIMER		
33	PLASTIC EMULSION PAINT		

			NICHOLSAN MAKE,
34	SYNTHETIC ENAMEL PAINTS		
35	RESIN BASED PAINTS		
36	EXTERNAL EMULSION PAINT		
37.	TEXTURE PAINT		
			BERGER/J&N/SPECTRUM/ASIAN/HALIMAR/ ICI
38.	CLEAR GLASS/ CLEAR FLOAT GLASS/ TOUGHENED GLASS		MODI/ SAINT GOBAIN (SG)/ ASahi INDIA / GSC/ ATUL
39	GYP SUM FALSE CEILING		INDIA GYP SUM/ LAFFARGE /ST. GOBAIN (GYPROC)
40.	METAL FALSE CEILING		NITTOBO/ ARMSTRONG/ DURLUM/ TRAC/ UNIMENT/HUNTER DUGLUS
41.	MODULAR SS RAILING SYSTEM		METALLICA INDIA/ D- LINE INTERNATION DENMARK / MOBEL HARDWARE/STEEL ARTS/RAVINDRAM INDUSTRIES.
42.	POLYSULPHIDE SEALANT		PIDILITE/ FOSROC/ CHOKSEY/ CICO TECH LTD /SIKA, MC BOUCHEMIE, BASF/FAIR MATE

43.	ALUMINIUM EXTRUSION	INDAL/ HINDALCO/ JINDAL.
44.	ALUMINIUM FABRICATORS	M/S. INTERNATIONAL GLASS HOUSE, M/S. AGV ALFA LAB LTD., M/S. CONSOLIDATED ENGG. COMPANY/ M/S. AJIT (INDIA) PVT. LTD. / CALCO / ALKARMA
45.	DOOR CLOSER / FLOOR SPRING	DOORKING/EVERITE/ HARDWYN/MASTER
46.	CEMENT	ACC (ASSOCIATED CEMENT CO.)/ L&T/ GUJRAT AMBUJA CEMENT / BIRLA CORP. LTD. (CEMENT DIVN.) JK CEMENT/ GRASIM CEMENT / SHREE CEMENT / CENTURY / LAFFARGE / PRISM / INDIA CEMENT / BINANI
47.	READY MIX CONCRETE	ACC/ UNITECH/RMC LTD./ L&T / COROMANDAL/ COMPUTRISED BMC PLANT BY CONTRACTOR
48.	REINFORCEMENT STEEL	SAIL/ RASHTRIYA ISPAT NIGAM LTD. / TISCO/ IISCO
49.	CALCIUM SILICATE BOARDS	HILUX / AEROLITE
50.	CACIUM SILICATE TILES	AEROLITE / HILUX.
51.	E.P.D.M. GASKETS	ANAND REDDIPLEX/ ENVIRO SEALS
52.	FLEXI TAPE	NORTON/ BIZZARE
53.	GLASS FIBRE ACOUSTICAL TILES	ECOPHON/ UP TWIGA

54.	SILICON SEALANTS (I) WEATHER SEALANT (II) STRUCTURAL GLAZING SEALANT	GE- SILICON/ PIDILITE/CHOKSEY/ WACKER/ FORSOC/ CICO/ DOW CORNING/ SIKA/
55.	WHITE CEMENT	BIRLA WHITE/ J.K. / GRASIM
56.	FALSE FLOOR S5YSTEM	DG FALSE FLOORING & TECHNOLOGIES PVT. LTD/UNITED ACCESS FLOOR PVT. LTD.
57.	PROTECTIVE COATING	BASF OR EQUIVALENT
58.	ACOSTICAL WALL AND CEILING SYSTEM	GYPROC OR EQUIVALENT

LIST OF APPROVED MAKES OF SANITARY AND PLUMBING MATERIALS

THE ENGINEER RESERVES THE RIGHT TO SELECT ANY OF THE BRANDS INDICATED IN THE LIST OF APPROVED MAKES. THE TENDERER SHALL QUOTE HIS RATES ON THE BASIS OF THE PRICE OF BEST QUALITY PRODUCT OF THE BRAND/MAKE STIPULATED IN THE ITEM OF WORKS AS DESCRIBED IN BOQ & SPECIFICATION AS WELL AS IN THE LIST OF APPROVED MAKE. THE CONTRACTOR CANNOT CLAIM ANYTHING EXTRA IF THE OWNER CHANGES THE MAKE BUT WITHIN THE LIST OF APPROVED MAKE.

SL. MATERIALS
NO.

BRAND NAME

1. VITREOUS CHINA
SANITARYWARE

HINDWARE / PARRYWARE /
CERA

2. W.C. SEATS & COVER

HINDWARE / PARRYWARE /
COMMANDER

3.	HANDICAPPED TOILET	HINDWARE/PARRYWARE/ COMMANDER
4.	STAINLESS STEEL SINKS	JAYNA/KINGSTON/ NEELKANTH/NIRALI
5.	C.P. FITTINGS & ACCESSORIES & FLUSH VALVES	JAQUAR/PARKO/KINGSTO/ HINDWARE / ESS-ESS
6.	LIQUID SOAP DISPENSER	CHILLY/EURONICS/JAQUAR/ UTEC / KOPAL
7.	SENSOR OPERATED AUTO FLUSHING SYSTEM FOR URINALS	JAQUAR / AOS SYSTEMS / ANGASH /EURONICS / UTEC
8.	HAND DRIER	KOPAL / EURONICS / UTEC
9.	SOIL, WASTE &RAIN WATER PIPES & FITTINGS SWR UPVC PIPES& FITTINGS FOR CONFORMING TO IS : 13592 - 92	SUPREME/ FINOLE/PRINCE/ ASTRAL / KISAN
10.	DUCTILE IRON PIPES (IS:8329)	ELECTROSTEEL/KESORAM/ JINDAL
11.	DUCTILE IRON FITTINGS (IS:9523)	ELECTROSTEEL/KESORAM/ JINDAL/KARTAR
12.	RCC PIPES	INDIAN HUME PIPE/ PRAGATI CONCRETE UDYOG/

ISI MARKED PIPES

- | | | |
|-----|--|---|
| 13. | G.I. PIPES | TATA/ JINDAL HISSAR /
PRAKASH SURYA |
| 14. | G.I. FITTINGS | R/KS / UNIK / ZOLOTO
MALLEABLE CAST IRON) |
| 15. | CPVC PIPES & FITTINGS

FOR INTERNAL &
EXTERNAL SUPPLY | AJAY / ASTRAL / ASHIRWAD
/
SUPREME |
| 16. | UPVC PIPES CONFORMING

TO IS:4985-2000 | SUPREME / FINOLEX /
ASTRAL /
KISAN |
| 17. | GUN METAL VALVES

(FULLWAY, CHECK AND
GLOBE VALVES) | ZOLOTO / LEADER / SANT/
KARTAR |
| 18. | C.I. VALVES

(FULLWAY, CHECK AND
GLOBE VALVES) | ZOLOTO/ KIRLOSKAR /
SANT / CASTLE / KARTAR |

19.	BALL COCKS, CHECK & FOOT VALVE, PRV, AIR VALVE	GPA/SANT/L & K / TBS / ZOLOTO
20.	STONEWARE PIPES & GULLY TRAPS	PERFECT/BURN/HIND / RK
21.	C.I. MANHOLES COVERS AND FRAMES	NECO / R.I.F. / B.C. /NEER/ HEPCO/SKF
22.	STAINLESS STEEL/C P GRATING	CHILLY/CAMRY
23.	COCKROACH TRAPS	CHILLY/CAMRY
24.	RCC/SFRC MANHOLE COVERS/ PRECAST RCC GRATING	KK / S K PRECAST CONCRETE/ ADVENT CONCRETOVISION
25.	PVC-U PIPES FOR SEWERAGE AND DRAINAGE CONFORMING TO IS:15328:2003 AND IS MARKED	SUPREME /FINOLEX / KISAN
26.	MIRROR	ATUL/ MODI GUARD /GOLDEN FISH / SAINT GOBAIN

- | | | |
|-----|---------------------|--|
| 27. | SOLAR WATER HEATING | SOLAHART INDIA / SOL POWER
/WBS INNOVATIONS/VENUS |
| 28. | WATER COOLERS | BLUE STAR/VOLTAS/USHA |
| 29. | WATER HEATER | RACOLD/VENUS / BAJAJ /
SPHEREHOT / AO SMITH
(JAQUAR) |
| 30. | PUMP | GRUNDFOSS/KIRLOSKAR |

SPECIAL CONDITIONS

ELECTRICAL

1. All electrical work shall be carried out in compliance with specifications given hereunder in this section and in compliance with Indian Standard specifications and Indian Electricity Act and Rules in force. The works shall also conform to any special requirement of Local State Electricity Board. If any case, the above-mentioned rules, regulations etc. are not in accord, the division of the consultant Engineer-in-charge regarding rules to be followed or manner of execution of work shall be final and binding. The work shall be executed under the direct supervision of person holding a certificate of competency issued by the State Government (Chief Electrical Inspector) for the type of works involved in conformity with the best methods of modern engineering practice and to the entire satisfaction of the Consultant / Engineer-in-Charge. The contractor has to submit the test report at various stages of completion as per requirement of the client
 - 1.1 Work shall be executed by licensed electrical contractor approved by the Owner / Architect / Electrical Inspectorate.
 - 1.2 These special conditions of contract shall be read in conjunction with the General

Conditions of Contract, Schedule of Quantities, Technical Specifications, Drawings and other documents relating to the work and shall have preference over laid down general conditions and specifications.

- 1.3 The contractor shall permit free access and afford normal facilities and usual conveniences to other agencies or departmental workman to carry out connected work or other work services under separate arrangements. The contractor will not be allowed any extra payment on this account.
- 1.4 All soil, filth or other matter of any nature taken out of any trench, sewer drain, cesspool or other place shall not be deposited on the surface, it shall at once be carted away by the contractor free of charge to a suitable pit or place to be provided to him.
- 1.5 The contractor shall provide all equipment, instrument labor and such other assistance required, by the Engineer-in-Charge for measurement of the work, materials etc.

MATERIALS

All materials, equipment's, fittings and fixtures used in electrical works shall conform to the attached list of approved make of materials.

All material shall be new, soundly and robust in construction and well finished. Surplus material after completion of work shall be taken back by the contractor and the cost shall be recovered if the advance payment has been made earlier by the client.

Unless otherwise stated in the conditions of contract, of contract, samples of all materials, fittings and fixtures to be supplied by the contractor shall be submitted to the engineer-in-charge for his approval. The contractor shall not commence the work until the samples are approved, in writing from the engineer-in-charge.

The contractor shall ensure that all the materials incorporated in the work are identical in all respects with the approved sample. All samples not destroyed in testing shall be returned to the contractor after completion of contract. No payment shall be made for samples destroyed in testing.

CLARIFICATIONS OF DISCREPANCIES

- 4.1 In case of any discrepancy between specifications and drawings etc. or disputes in respect, the interpretation and decision of the Engineer/ project-in-Charge shall be

final and binding.

MISCELLANEOUS

- 5.1 After completion of the work the whole installation shall be tested by the contractor in the presence of the Engineer/ Project-in-charge. The tests shall comply the I.E.E. Regulations. The contractor shall be responsible to provide all the necessary testing instruments, such as megger, insulation tester, earth tester, multi meter, AVO meter etc. for carrying out the above tests.
- 5.2 The work will not be considered as complete and taken over by the Employer till all the components of the work after being completed at site in all respects have been inspected / tested by the Engineer-in-Charge to his entire satisfaction and a completion certificate issued by the Project Engineer/Project-in-Charge to this effect.
- 5.3 At the completion of the work and before issuance of certificate of virtual completion, the contractor shall submit 3 set of as built drawings with one reproducible of each drawing. Layout drawings drawn at approved scale indicating the complete wiring / cabling / earthing system as installed.
- 5.4 The contractor shall submit a detailed schedule of program of work, on demand of Owner's Representative/Project Engineer/Project-in-Charge.

WORK AND WORKMANSHIP

- 6.1 The work shall be of the highest standard, both as regard its design and workmanship. Modern tools and first class, latest techniques shall be employed for its execution.
- 6.2 Any damage done to the building during the execution of work shall be responsibility of the contractor and it shall be made good by him, at his cost, to the entire satisfaction of the Owner's Representative/Project Engineer/Project-in-Charge.
- 6.3 All electrical work shall be executed by skilled electricians under the direct supervision of whole time, fully qualified licensed electrical engineers and supervisors. The contractor shall produce requisite evidence regarding the qualification of the engineer, supervisors and other workers.
- 6.4 The contractor shall possess all the relevant and valid licensed as per the regulations of the Indian Electricity Rules and the Local Electrical Inspector's requirements.

CERTIFICATE OF INSPECTION

- 7.1 Complete scheme drawing for equipment's/earthling/cable layout/schematic drawing and other details as per requirements shall be prepared by the contractor and got approved by Owner's Representative/Project Engineer/Project-in-Charge, before commencement of work. Nothing shall be payable to contractor on this account.
- 7.2 The contractor shall be responsible for getting the installation inspected and approved by the Electrical Inspector and other, local electric supply company.
- 7.3 The contractor shall obtain and deliver to Owner's Representative/Project Engineer/Project-in-Charge the certificate of final inspection and approval of the local electrical authorities concerned. The statutory fees etc. shall be paid by the contractor and it may be reimbursed on submission of original documents.
- 7.4 In case of any defects are pointed out by the Electrical Inspector(State/Central Authority) , the contractor shall remove these defects at his own cost and arrange for re-inspection or inspection by the electrical inspector, till such time the installation is finally approved and the required certificate is issued. The contractor shall bear all expenses and deposit the necessary fees for subsequent inspections by the Inspectorate/Board.
- 7.5 Owner's Representative/Project Engineer/Project-in-Charge shall have full powers to get the material or workmanship *etc* inspected and tested by an independent agency, at the contractor's expenses in order to ascertain their soundness and adequacy.
- 7.6 The contractor shall be responsible for obtaining all necessary approvals for entire scheme from State Electrical Board before commencement of the work. All coordination with SEB shall be responsibility of contractor till commissioning and getting electricity in the complex and finally handing over the installation.
- 7.7 The contractor shall possess State Electrical Contractor's license and all the relevant and valid other licenses as per the regulations of the Indian Electrical Inspector's requirements.
- 7.8 Any amount to be deposited with the State Electrical Board shall be deposited by the contractor after observing necessary formalities required and take all follow up action for the same. However, the amount so deposited by the contractor will be reimbursed to the contractor on production of necessary and adequate

documentary proof/records.

- 7.9 Working drawing for all system shall be prepared by the contractor & got approved before starting of the work.

TECHNICAL SPECIFICATIONS

ELECTRICAL

LT SWITCH BOARDS (CUBICAL TYPE)

The switch board shall be metal clad, totally enclosed, single front, floor mounted, cubical type for use on 415 volts 3 phase, 50 cycles system with a fault level withstand of 50kA RMS symmetrical. The switch board shall be made up of the requisite vertical sections. Which when coupled together shall form continuous dead front switch boards of dust and vermin proof construction. All doors shall be provided with neoprene gaskets. Each vertical panel structure shall contain a cable way alley of adequate width with provision for suitable cable supports. The cable compartment shall have hinged door. There shall be a separate gland plate for each cable entry. The entire switch board shall be factory

assembled. The type of enclosure shall atleast provide degree of protection covered by IP:53 (weather proof enclosure) of IS:2147-1962

The panel shall include the required number of MCB / FSU and breakers as per item, Aluminum bus bars as per requirement and item of work with separate neutral bar & earth bars.

The units should be arranged in their formation to provide a compact switch board having a pleasing appearance. The minimum depth of switch board shall be 450mm and the height be restricted to 2000mm. Safety interlocks shall be provided. All the MCCB's shall be provide with vertical operation.

All indicating instruments shall be of the flush mounting industrial pattern conforming to the requirement of IS:124. Separate compartment shall be provided for accommodating instruments, indicating lamps, control contractors and fuses etc. these shall be accessible for testing and maintenance without any danger of accidental contact with line parts of the circuit breakers, unit's bus bar and connections.

Control wiring shall be of copper conductor and shall be color coded for easy identification of circuits. This should be of not less section than 2.5 sq mm not more than two connections shall be made off anyone terminal.

All cable shall be neatly bunched and shall be secured to wiring cradles. All outgoing cables shall be fitted with identification ferrules at each end. Circuit diagram showing the arrangement of circuits shall be pasted on the inside of panel door and covered with transparent plastic sheet. Knockout holes of appropriate size and number shall be provided with panel in conformity with the location of incoming and outgoing cables/conduits. Facility shall be provided for termination of cables from both above and below the panel. Where cables enter from below, cable eyes shall be provided for connections to main earth. The earth bar shall run within the base frame.

All steel material used in the construction of the switch board should have undergone seven tank process and the final finish of approved color and shall be devoid of pin holes or any other deformation.

Engraved plastic labels shall be provided indicating the feeder details. Danger notice plate shall also be provided as per I.E. Rules. All nuts, bolts and washers shall be cadmium plated.

The construction details of the LT panel shall be submitted and got approved by the engineer-in-charge before fabrication. The installation charges shall include the cost of supply, fabrication and installation of all the necessary steel supports for the erection of the panel.

PLC CONTROLLER

PLC (Programmable Logic Controller) shall be provided for auto functioning of MSB including auto operation of Transformers and D.G. Set with load sensing. The PLC controller shall be designed, manufactured and tested as per the latest applicable industry standards. The PLC and operator work station shall be solid state, modular, and field expandable design allowing the system to be tailored to meet the application. The PLC system shall be capable of operating in an ambient temperature of 0 to 60 degree Celsius and shall function continuously in the relative humidity range of 0-93 percent non condensing. The CPU and IO shall be with conformal coating for harsh environment applications. The Contractor shall design the PLC system in traditional ladder logic and submit the same for approvals.

Each PLC system shall include but not limited to the following :

1. Local & Remote IO Chassis & IO Modules
2. Power Supply
- 3.Processor
4. Redundant CPUs
5. Interfacing ports
6. Associated software for system interfacing.
- 5.Cables (Wring/cables for PLC purpose shall not be paid extra)

DISTRIBUTION BOARDS

Distribution boards shall be of standard make with MCB's as per approved makes and factory assembled with latching covers flush lock. Ample clearance between the conductors of opposite pole, between conductors and sheet steel body shall be maintained in order to obviate any chance of short circuit. Removable conduits entry plates shall provided at top and bottom to facilitate drilling holes at site to suit individual requirements. The MCB's shall be mounted on a high grade rigid insulating support and connected by electrolytic copper bus bars. Each incoming MCB isolator shall be provided with solder less cable sockets for crimping. Phase separation barriers made out of are resistant materials shall be provided between the phases. Bus bars shall be color coded for phase identification.

Distribution boards shall be recessed in wall niche or if required mounted on the surface of the wall with necessary clamp bolts etc. as required at a height not exceeding 1600 mm from finished floor level. Distribution board shall be provided with proper identification name plate, danger mark etc.

All the distribution boards shall be marked 'lighting',' power' or 'Emergency' as the case may be. Each D B shall be provided with a circuit list giving details of each circuit. All the outgoing circuit wiring shall be provided with identification ferules giving the circuit

number and phase.

Each distribution board shall have a separate neutral connection bar and a separate earth connection bar mounted within the board each having the same number of terminals as the total number of outgoing individual circuits from the distribution board. Suitable earth terminal shall be provided on the distribution board for bonding to earth.

Distribution boards shall be duly rust inhibited through a process of degreasing, acid picking Phosphating and spray primer. The entire board shall be rendered dust and vermin proof with necessary sealing gaskets.

MCB's shall have quick make and break non-welding silver alloy contacts, both on the manual and automatic operation. MCB's shall be of thermal magnetic type with inverse time-delay over-current tripping, having a short circuit rupturing capacity of 9KA. In case of multiple breakers the tripping must be on all the poles and shrouded, wherever MCB isolators are specified they are without the tripping elements. Necessary adopter box of suitable size shall be provided to facilitate the wiring and nothing shall be payable on this account.

L.T. CABLE

L.T. cable shall be of aluminum/copper conductor as per the BOQ (Bill of quantities) or as instructed by project engineer / Project-in-charge, FRLS type PVC insulated, PVC sheathed steel tape armored construction conforming to IS- 1554 of 1100 volts grade. The aluminum conductors shall be stranded for sizes above 16sq mm and sector shaped standard conductors shall be used for heavy sizes. As far as possible, cables shall be supplied in drums. Cables supplied shall bear manufacturer's identification marks at regular intervals.

CABLE TERMINATIONS

Cable leads shall be terminated at the equipment terminals by means of crimp type connectors. Crimping shall be done by hydraulically operated tools and conduction jelly shall be applied. On the conductor Insulation of the leads should be removed immediately before the crimping. Conductor surface shall be cleaned and shall not be left open for long, prior to crimping to prevent oxidation. Control cables of single strand cables may be directly terminated on to the terminals. Straight through joint if required shall be made by rising epoxy resin cold setting compound type of approved brand. Compression brass cable gland wherever used shall be of current size for cable and terminations. No oversize cable glands shall be used. The gland must grips the armor of the cable firmly, so that in the event of ground movement no undue stress is transferred to the cable conductors. The gland must establish good electrical contact between cable armor, lead sheath and body of switcher. Identification ferrules indication the circuit shall be used for incoming and

outgoing cables.

CABLE WORK IN UNDER GROUND

While laying underground cables care should be taken so that any underground structure such as water pipes, sewerage lines, etc. are not damaged. Any telephone or other cable coming in the way shall be properly protected as per instructions of Engineer-in-charge. All cable routes shall be carefully measured and cable cut to the required lengths leaving sufficient length for the final connection of the cable. All cable trenches entering sub-stations plants etc. shall be effectively sealed after installation of cables to avoid entry of water.

The L.T. cables shall be laid not less than 75 cm below ground level in a trench 35cm wide minimum. The depth of the trenches shall be uniform throughout. A bed of 17 cm dry sand shall be laid before the cable is laid.

When the cable is properly straightened and laid in the trench, it should be covered all around 8mm thick layer of sand. Approved cable indicators shall be fixed at suitable distances along the route of the cable.

Unless otherwise specified the cables shall be protected by second class bricks of not less than 22.5x 10.0x7 cm or stone tiles or any other approved material placed on sides and top of the cable to form a channel throughout the length.

Filling of trenches shall be done after the sand cushioning and laying of tiles are carried out to the satisfaction of the engineer-in-charge, where ever roads or lawns have been cut off or Kerb stones displaced the same shall be repaired/replaced to the original finish without any extra cost.

CABLE WORK

LAYING OF CABLES OVER DUCTS/ WALL/TRAYS:-

Cable ducts should be of such dimension that the cables laid in it do not touch one another. Cables shall be neatly arranged on the trays in such manner that cross-crossing is avoided and final take off to switch gear is easily facilitated.

All cables will be identified close to their termination point by cable number as per circuit schedule. Cable numbers will be punched on 2mm thick aluminum strips and securely fastened to the cable. In case of control cables all covers shall be identified by their wire numbers by means of PVC ferrules. For trip circuit identification additional red ferrules are to be used only in the switch gear/ control panels, cables shall be supported so as to prevent appreciable sagging. In general distance between supports shall not be greater

than 600mm for horizontal run and 750mm for vertical run.

TESTING OF CABLES:-

After laying and jointing work is completed, a high voltage test should be applied to all cables to ensure that they have not been damaged during or after the laying operation and that there is no fault in the jointing. The cable shall be tested with an insulation tester of appropriate rating. In case, the test results are unsatisfactory the cost of all repairs and replacement and relaying will be made good by the contractor. Nothing shall be payable for conducting high pot test.

CABLE TRAYS:

The Cable trays if fabricated out of mild steel/ slotted angles and flats shall be of required width as per design. Bends shall be prefabricated the cable tray shall be primed and painted with two coats as approved by Engineer - In - Charge. Suitable provision shall be made where a tray crosses expansion joints. The width of the tray shall allow for a suitable separation between cables the design shall allow for adequate bending reduces for the sizes of cables.

The tray shall be suspended from the soffit of the concrete slab by means of approved steel hangers spaced at a distance of not more than 100cms. Suitable bushes shall be provided where cables pass through apertures in the tray. Cable must securely fixed to the tray with fasteners. In routing, necessary barriers and spacing shall be maintained for cables of different voltages in case they lie side by side. Telephone cables shall cross the power cables only at about right angle and these two shall not run in close proximity. Full details of the tray shall be approved by the site engineer before fabrication. Earth continuity shall be maintained between each section of cable tray and each total run of tray shall be effectively bonded to the nearest earth continuity conductor. All nuts and bolts used shall be of galvanized steel.

EARTHING

All non-current carrying metal parts of electrical installation shall be earthed as per IS:3043-1986 with latest amendments. All metal conduits, cable sheathes, switch gear, DB's, light fixtures, equipments and all other parts made of metal shall be bonded together and connected to earth electrodes. Earthing shall be in conformity with provision of rules 32, 61, 62, 67 & 68 of Indian electricity rules (1956).

All earthing conductors shall be of high conductivity copper and shall be protected against mechanical damage. The cross sectional area of earth conductors shall not be smaller than half that of the largest current carrying conductor. However the contractor shall use the sizes specified in the bill of quantities. Main earth bus shall be taken from the L T. Switch

board to earth electrodes. No earth pit shall be fixed within 2m of a wall or foundation. Efforts shall be made to locate them in grass lawns or near flower beds or water taps. The distance between two earthing stations shall be at the least 3m.

For plate earthing , the earth electrodes shall be 1200x1200x6mm C.I plate. The earth resistance shall be maintained with a suitable soil treatment. The resistance of each earth station should not exceed 5 ohms.

The earth lead shall be connected to the earth plate through copper/brass bolts. The earth plates, G.I. pipes, cross Cu bars and down copper connections shall form an earthing station.

400kVA USS :

The Unitized Substation shall be compact in construction. The equipment offered shall be complete with all necessary parts for effective and trouble-free operation in the proposed system. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not. The design, manufacture and performance of the equipment shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the tenderer off his responsibilities. It shall comprise mainly of the following :

1. 400 kVA Copper wound 11KV /433 V Dry type cast resin type Transformer .
2. 11kV, 630A, 40kA VCB
3. Cable entry chambers for HV and LV side
5. CTs,PTs, HRC Fuses, TOD Meter chamber with suitable sealing facility and all accessories complete.
6. All other standard fittings and accessories complete conforming to relevant standards.

Tolerances on all the dimensions shall be in accordance with provisions made in the relevant

Indian standards and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

SYSTEM PARTICULARS:

TRANSFORMER:

Type	:	Cast Resin, Core Type, Double
Wound		
kVA	:	400 kVA
Nominal System Voltage	:	11kV
Corresponding Highest System Voltage	:	12kV
Vector group	:	Dyn-11.

Nominal voltage ratings

Primary voltage`	:	11 kV
Secondary voltage	:	0.433 kV
Frequency	:	50 Hz with ± 3 % Tolerance
Neutral earthing	:	Solidly earthed
Percentage Impedance	:	5% at 75deg C (subject to IS tolerance)
Tapping on HV side	:	+5% TO -10% IN STEPS OF 2.5% Changeable by off circuit tap links
Type of Installation	:	OUTDOOR
Type of Insulation	:	CLASS F
Impulse Voltage withstand at HV Side	:	75kV (p)
Power frequency withstand voltage	:	
HV SIDE	:	28 kV (rms)
LV SIDE	:	3 kV (rms)
Applicable Standards	:	IS:2026/77, IS11171/85

The windings of the transformers shall be connected to Delta (Δ) on the primary side and star (Y) on the secondary side. The neutral of the LT winding shall be brought out to a separate terminal.

HT Panel:

Type	:	VCB
Rating	:	11kV, 630A, 40kA
CT Ratio	:	30/5 5VA, CI 0.5,
PT ratio	:	11KV/110V, 100VA, CI:0.5
Bus bar rating	:	630A
Shunt Trip coil	:	230 V AC

The unit shall comprise of all standard accessories like bushings, space heater, thermostat, provision for fixing TOD meter, sealing provision, etc. complete.

CCTV The executor shall be a reputed system integrator / authorized agent of reputed CCTV Camera, DVR manufacturer.

The functions intended from the proposed CCTV systems shall be as follows but not limited to the following:

1. To provide continuous & real time surveillance of the intended areas during daytime as well as night.

2. To monitor entry and exit of all persons/materials/anyothers at the entrances/exits and keep recording of the same for the stipulated period.
3. There shall be provision for retrieving the recorded videos vide external means for archiving/proof of evidence and for any other purpose when necessary.

FIRE DETECTION AND ALARM SYSTEM

The proposed fire detection & alarm system is intended to provide adequate safety measures in the areas susceptible to fire in compliance with the statutory requirements. Any equipment / item not specifically mentioned in the technical specification but are found necessary to meet the statutory requirements shall include in scope of supply.

HVAC

1. SCOPE OF WORK

The complete scope of work shall cover supply, installation, testing and commissioning of Air Conditioning System including sizing of ducts, pipes routing & exhaust ventilation for toilets including ducting. The contractor shall submit the design & drawings for approval and obtain approval from the engineer-in-charge before commencement of works. The scope of work includes testing for air changes per hour with fresh air changes, Air velocity, Positive pressure, Air quality - air filtration-(particles test), temperature and humidity, validation of filters by appropriate tests .

2. Basis of Design

The entire system has been designed based on climatological data available as given under the section basis of Design. The technical requirements given under here are only indicative and not descriptive and the contractor shall ensure that the whole system supplied is complete in all respects for the smooth operation of the plant and should be suitable for the rated performance.

The design parameters to be used for detailed design of the air conditioning system as follows:

Outside Ambient Conditions

Summer : DB: 44oC & WB: 19oC

Monsoon: DB: 26.1 & WB: 15.1oC

Inside Design Condition:

Lab Temperature : 22oC

Room temperature : 4oC+1.1oC

Relative Humidity : 55% + 5%

Detail Input conditions are mentioned below:

Sl. No.	AC Space	Area (Sqft)	Occupancy	Lighting (W/Sft)	Equipment (kW)	Fresh air (cfm)
1	Reception	885.70	35	1.5	5	3800
2	Lab	687	30	2.0	15	3700
3	Imaging	995	20	1.5	5	4000

3 . Terms and Definitions

The following terms have been used in the tender specifications, drawings, etc.

BIS - Bureau of Indian Standards

ASHRAE - American society of Heating, Refrigeration and Air-conditioning Engineers, USA.

ASME -American Society of Mechanical Engineers.

ASA -American Standard Association.

B.S -British Standards

CMH -Cubic Meter per Hour

CFM -Cubic Feet per Minute

US GPM -US Gallons per Minute

IGPM -Imperial Gallons per Minute.

RPM -Revolutions per Minute

BTU/Hr. - British Thermal Unit per Hour

KCal/Hr. - Kilo Calories per Hour

HZ - Hertz

H.P. - Horse Power

Kg/CM² - Kilo Gram per Square Centimeter

SG - Supply Air Grilles

SD - Supply Air Diffuser

SAF - Supply Air Filters

FD - Fire Damper

VCD - Volume Control Damper

RG - Return Air Grilles

RD - Return air diffuser

FAD - Fresh Air Damper

RH - Relative Humidity

DB - Dry Bulb Temperature

WB - Wet Bulb Temperature

MV - Mechanical Ventilation

DP - Drain Point.

RO - Rate Only

The design, manufacture, identification of material and testing of the equipment covered in this specification shall comply with the latest edition of the appropriate standard of the following:

- 1) Duct Work - IS:655 (latest edition)
- 2) Welding - IS:3589
- 3) Refrigeration and Air-conditioning - As per ASHRAE/ISI air-conditioning and refrigeration institute standards.
- 4) Sluice Valves for Water Lines - IS:778-1980
- 5) Copper alloy Gate/ Globe / Check Valve for water lines - IS:778
- 6) Colour code for the identification of pipe lines - IS:2379-1963
- 7) Specific requirements for the direct switching of the individual motors - IS:4064 (Part-II)-1978
- 8) PVC insulated (HD) Electric Cables for working voltage up including 1100 Volts - IS:1554 (Part I)
- 9) Starters - IS:8554 (Part-I) 1979
- 10) HRC Cartridge fuse links upto 650 Volts - IS:2208
- 11) Inspection and testing of installation IS:732 (Part-III) 1979
- 12) Galvanized steel wire for fencing - IS:277-1977
- 13) Three phase induction motors - IS:325
- 14) Horizontal centrifugal pumps - IS:1620
- 15) Wrought aluminum and aluminum alloy sheet and strip for general engineering purposes - IS:737
- 16) Bourdan tube pressure & vacuum gauges - IS:3624
- 17) Glossary of terms used in refrigeration and air-conditioning - IS:3615
- 18) Code for practice for standard for selection of standard worm and helical gears - IS:7403
- 19) PVC insulated (heavy duty) electric cables for working voltage upto and including 1100 watts: -IS:1554 (Part-I)
- 20) Expanded Polystyrene (EPS) : - IS 4671.
- 21) Resin bonded glass wool: - IS 8183.

4 . Safety Codes

The following IS codes shall be followed:

- ☐ Safety code for mechanical refrigeration - IS:660
- ☐ Safety code for air-conditioning - IS:659
- ☐ Safety code for scaffolds & ladders -IS:3696
- ☐ Code of practice for fire precautions in welding & cutting operations - IS:3016
- ☐ Code for safety procedures and practices in electrical works - IS:5216
- ☐ Code of practice for safety and health requirements in electrical & gas welding and cutting operations - IS:3696
- ☐ Indian Electricity Act 1910
- ☐ Electricity Supply Act and Indian Electricity Rules.

5 . MACHINERY

AIR COOLED PACKAGED/DUCTABLE AIR CONDITIONING UNIT

a.Cabinet

The packaged split air conditioning units shall have metal cabinet of min 1.6mm thick (16 gauge) galvanized sheet steel. The body should be machine pressed and adequately stiffened. The body should be chemically treated for corrosion resistance and Polyester powder coated.

b.Compressor

All compressors shall be hermetically sealed scroll type of suitable capacities. Compressor shall be suitable for R22 refrigerant. The compressor shall be electrically interlocked with indoor and outdoor fan motors, HP/LP cutouts and thermostat in the evaporator. The compressor shall be housed inside the Condenser.

c.Condenser (Air cooled)

The coils shall be made of copper hydraulically bonded with aluminium fins. The tubes shall have a minimum of 9.5 mm outer diameter, firmly bonded with aluminium fins spaced at 12-14 fins/inch. The air velocity across the face of the coil shall not exceed 200 m/min. The coils shall be designed for a maximum working pressure of 35 kg./sq.cm. The condenser coil shall be protected on the open end by a wire mesh duly powder coated/plastic coated.

d.Evaporator coil

The coils shall be made of copper hydraulically bonded with aluminium fins. The coils shall be hydrophilic in nature. The tubes shall have a minimum of 9.5 mm outer diameter, firmly bonded with aluminium fins spaced at 12-14 fins/inch. The air velocity across the face of the coil shall not exceed 170 m/min. The coils shall be designed for a maximum working pressure of 35 kg/sq.cm. The circuit should include a thermostatic expansion valve/capillary tube, distributor, liquid strainer, suction line shut off valve and liquid line shut off valve.

e.Condenser motor

The condenser motor shall be of IP-55 rating.

f.Refrigeration piping and accessories

Only hard drawn copper shall be used in piping with brass fittings wherever required. Brazing shall be with silver copper phosphorous alloy. Horizontal lines shall have a grading

of at least 1:250 away from the compressor and towards condenser to prevent gravity draining of oil to compressor. Liquid lines shall be sized to ensure that flashing of liquid refrigerant does not occur. The circuit should include a thermostatic expansion valve, distributors, liquid strainer, de-hydrator and liquid lines shut off valve and suction line shut off valve.

Leaks shall be tested with soap solution at a minimum pressure of 21 kg/sq.cm. After all leaks have been repaired, system shall be tested 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. After satisfactory completion of the pressure test, the system shall be evacuated to reduce the pressure to 0.1 Kg/Sq.cm. for a period of 6 hours and vacuum broken. A vacuum pump connected to the refrigeration system shall be used to create the vacuum and the installed compressor shall not be used to create the purpose. The system shall again be evacuated and a vacuum of 0.01 Kg/Sq.cm. maintain for 24 hours before charging with correct quantity of refrigerant and oil. The system shall be operated for 12 hours and then again tested for leaks.

g.Drain Piping

Drain pipe shall be of 32mm dia. PVC pipes. All Ductable Split units shall be provided with independent drain lines. And all the drain line above false ceiling shall be insulated. The drain shall be taken to the nearest exit points.

h.Fan

Fan section including wheel and housing shall be of heavy gauge steel/aluminium. Fans shall be centrifugal, forward curved multi-blade type. Fan housing shall have inlets and guide vanes for smooth air flow. Fans shall be complete with drive motor. The fans should be statically and dynamically balanced. The fan motor should be resilient mounted. The fan should deliver a static pressure of 125 mm.

i.Dampers

All fresh air intakes shall be provided with dampers. The fan outlets should be controllable with a damper. The supply collars, wherever mentioned, shall be provided with collar dampers.

j. Filters

All evaporator units shall be provided with air filters capable for filtration upto 20 microns. The filters shall be of washable synthetic fibre type.

k. Control Panel

All units shall have independent electrical control panels housing contactors, overload relays, voltage cutouts, time delays, interlocks, strip connectors, indication lamps, and control fuse. All these have to be housed inside the Outdoor unit of each circuit.

l. Thermostat

The Thermostat shall be control wired with the control panel and shall be placed in the return air path inside the boxing.

m. Installation

Adequate vibration isolation using rubber/neoprene pads/vibration springs in order to reduce transmission of vibrations to the floor shall be provided for all condensing units.

n. Testing

Ductable units after installation shall be tested for its conformity to specifications. Units shall also be tested for the rated capacity and power consumption.

o. Electric motor

The electric motor driving the compressor shall be as per manufacturer's standard for this compressor and motor shall be suitable for operation on A.C. supply. The motor shall be continuous duty rated for the application. The motor shall be selected such a way that the motor rating is for actual requirement.

The motor shall be provided with suitable bearing to take care of loads/thrust. Necessary lubricators shall be provided to enable the bearings to be correctly greased as required. The tenderer shall also calculate KW/TR.

p. AHU

The AHU shall be AR certified floor mounted/ceiling suspended type, double skinned type made of 0.6mm pre-coated GI sheets on both sides min 40mm thick PUF CFC free, 40kg/m³ between sheets, SS 304 drain pan with nitrile rubber insulation, GSS base channel. Suitable for DX coil of copper 6 rows min, Aluminum fins, with synthetic non woven type pre (EU4) and fine filters (EU 7) filtration up to 3microns. The AHU shall be with suitable static blower DIDW, centrifugal, forward curved blade, belt driven for hepa filter application comprising of suitable rated motor min EFF1 rated. The AHU shall also be provided with manual volume control damper on supply, return and fresh air sides to control the air volume. The AHU shall be UL certified for safety. The AHU shall be provided with access doors for filter cleaning and maintenance etc.

6. DUCTING SYSTEM

This section deals with supply, erection, testing and commissioning of all sheet metal ductwork conforming to specifications given below. The ducts shall be of factory fabricated.

6.1 Material for Ducting

All ducts shall be fabricated from galvanized sheet of 120 gm/sq.m (Class VIII) confirming to IS 277-1962 (revised). The fabrication of duct shall strictly conform to ISS 655-1963. The thickness of the sheet shall be as follows:

Maximum	Thickness	Type of Transverse	Bracing
Upto 600	0.63	S-drive, pocket or bar, slips, on 2.5 m centers	None
601 to 750	0.63	S-drive, pocket or bar, slips, on 2.5 m Centers, S-drive 25 mm pocket, or 25 mm bar slips on 2.5 m centers.	25 x 25 x 3 mm, angles, 1.2 m from joint.
751 to 1000	0.80	Drive, 25 mm pocket or 25 mm bar slips, on 2.5 m centers 40 x 40 mm angles connections.	25 x 25 x 3 mm angles, 1.2 m from joint.
1001 to 1500	0.80	40 mm bar slips, with 35 x 3 mm bar reinforcing on 2.5 m centers	40 x 40 x 3 mm angles, 1.2 m from joints.
1501 to 2250		40 x 40 mm angle connections, or 40 mm bar slips, 1 m maximum centers with 35 x 3 mm bar reinforcing.	40 x 40 3 mm diagonal angles, or 40 x 40 x 3 mm angle 60 cm from joint.
2250 and above	1.25 18 G	50x50mm angle connections, or 40mm pocket or 40mm bar slips, 1 m maximum centres with 35x3mm bar reinforcing	40x40x3mm angle / 40x40x3mm angle 60mm from joint.

The following points shall be also taken into account while fabrication of ducts.

- All ducts shall be as per gauges, etc. indicated on the approved drawings.
- All ducts of size larger than 450 mm shall be cross broken.
- All ducts shall be supported from RCC/truss by means of MS rods, angles, etc.
- The ductwork shall not extend outside and beyond height limits as specified on the approved drawings.
- All ducts shall be reinforced, if necessary and must be secured in place so as to avoid shifting of the ducts on its supports.
- The vanes shall be provided and securely fastened to prevent noise and vibration.

- g) The rubber gasket shall be installed between duct flanges in all connections and joints.
- h) The ductwork can be modified in consultation with Purchaser to suit actual conditions in the building.
- i) All flanges and supports should be primer coated on all surfaces before erection and painted with aluminum paint thereafter.
- j) The flexible joints are to be fitted to the suction and delivery of all fans with double heavy canvass. The length of flexible joints should not be less than 150 mm.
- k) All sheet metal gauges and fabrication procedure as given in BIS specification shall be strictly adhered to. The BIS specification shall form part of this contract.

6.2 Grilles/Diffusers

Material of construction - Extruded Aluminum

Supply air and return air grilles shall be continuous type and shall be fixed as given in the approved drawing. The square/rectangular diffusers shall be flush or step down type to match false ceiling pattern. The diffuser blades shall be die formed, flush mounted with single or double direction airflow. Supply of frames for fixing the grilles/diffusers, if required, is also in the scope of the contractor.

Return air grilles shall be with blanks and return air provisions. The size and appearance shall match with supply air grilles. The supply air grilles shall form part of the continuous return air grilles. The fixing of grilles/diffusers should be done in close co-ordination with false ceiling work and as directed by Purchaser. The aluminum grilles/diffusers, etc. shall be powder coated of colours to match the interiors. However, successful bidder shall have to obtain prior approval regarding colour, finish, shape, etc. of grilles/diffusers and sample should be submitted to Purchaser for approval.

6.3 Testing

The complete duct system shall be tested for air leakage and complete air distribution systems shall be balanced in accordance with the approved drawings for achieving designed values inside the building.

7 THERMAL / ACOUSTIC INSULATION

7.1 Material

- ⑦ Insulation material shall be Closed Cell Elastomeric Nitrile Butadiene Rubber.
- ⑦ Insulation material shall have anti-microbial product protection. The antimicrobial product protection shall be an integral part of insulation that is built-in during the manufacturing process and the product protection should not allow the microbes to function, grow and reproduce.
- ⑦ Resistance towards microbiological growth on insulation surface should confirm to following standards: Fungi Resistance – ASTM G21 where the fungal growth on the surface is NIL after 28 days of incubation at 28 – 30 deg C and Bacterial resistance – ASTM E 2180 where the reduction of bacterial growth is minimum 99.9% after 24 hours of incubation at 34 – 38 deg C.
- ⑦ Thermal conductivity of Elastomeric Nitrile rubber shall not exceed 0.035 W/m²K at an average temperature of 20^oC in accordance to EN12667
- ⑦ The insulation shall have fire performance such that it passes Class 1 as per BS476 Part 7 for surface spread of flame as per BS 476 and also pass Fire Propagation requirement as per BS476 Part 6 to meet the Class 'O' Fire category as per 1991 Building Regulations (England & Wales) and the Building Standards (Scotland) Regulations 1990.
- ⑦ Water vapour permeability shall not exceed 1.74 x 10⁻¹⁴ Kg/m.s.Pa, i.e. Moisture Diffusion Resistance Factor or 'μ' value should be minimum 10,000 according to EN 12086
- ⑦ Density of Material shall be between 40 to 60 Kg/m³.

7.2 Duct Insulation

External thermal insulation shall be provided as follow:

- ⑦ The thickness of Nitrile rubber shall be as shown on drawing or identified in the schedule of quantity. Following procedure shall be adhered to:
- ⑦ Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work. Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubbers sheets to size with sufficient allowance in dimension.
- ⑦ Material shall be fitted under compression and no stretching of material shall be permitted. A thin film of adhesive shall be applied on the back of the insulating material sheet and then on to the metal surface. When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. All longitudinal and transverse joints shall be sealed as per manufacturer recommendations. The adhesive shall be strictly as recommended by the manufacturer.
- ⑦ The detailed Application specifications are mentioned separately.

7.3 Insulation of Ducts Exposed Directly to Sunlight

For installations exposed to sunlight, after giving 36 hours curing time for the adhesive apply manufacturer's recommended UV/Mechanical Protection. Please refer the separate detailed guidelines on UV/Mechanical Protection.

7.4 Piping Insulation

All chilled water, refrigerant and condensate drain pipe shall be insulated in the manner specified herein. An air gap of 25 mm shall be present between adjacent insulation surfaces carrying chilled water or refrigerant. Before applying insulation, all pipes shall be brushed and cleaned. All Pipe surfaces shall be free from dirt, dust, mortar, grease, oil, etc. Nitrile Rubber insulation shall be applied as follows:

- Insulating material in tube form shall be sleeved on the pipes.
- On existing piping, slit opened tube of the insulating material (slit with a very sharp knife in a straight line) shall be placed over the pipe and adhesive shall be applied as suggested by the manufacturer.
- Adhesive must be allowed to tack dry and then press surface firmly together starting from butt ends and working towards centre.
- Wherever flat sheets shall be used it shall be cut out in correct dimension. All longitudinal and transverse joints shall be sealed as per manufacturer recommendations.
- The insulation shall be continuous over the entire run of piping, fittings and valves.
- All valves, fittings, joints, strainers, etc. in chilled water piping shall be insulated to the same thickness as specified for the main run of piping and application shall be same as above. Valves bonnet, yokes and spindles shall be insulated in such a manner as not to cause damage to insulation when the valve is used or serviced.

The detailed application specifications are as mentioned separately. The manufacturer's trained installer should only be used for installation.

7.5 Recommended Adhesive

In all cases, the manufacturer's recommended Adhesive should be used for the specified purpose.

7.6 Acoustic Insulation

Material shall be engineered Nitrile Rubber open cell foam.

The Random Incidence Sound Absorption Coefficients (RISACs) across the octave band frequencies; tested as per ISO 354, and Noise Reduction Coefficients (NRCs) for the Acoustic Insulation should be minimum as per the below chart:

Freq (Hz)	125	250	500	1000	2000	4000	NRC
10 mm	0.03	0.04	0.14	0.40	0.88	1.00	0.40
15 mm	0.01	0.09	0.29	0.74	1.08	0.83	0.55
20 mm	0.04	0.13	0.40	0.90	1.04	0.90	0.60
25 mm	0.05	0.25	0.86	1.14	0.88	0.99	0.80
30 mm	0.07	0.32	0.99	1.16	0.93	1.08	0.85
50 mm	0.23	0.73	1.29	0.99	1.09	1.11	1.05

The material should be fibre free.

- The density of the acoustic insulation should be minimum 140 Kg/m³
- The insulation should have Microban®*; Built-in Anti-Microbial Product Protection, and should pass Fungi Resistance as per ASTM G 21 and Bacterial Resistance as per ASTM E 2180.
- The insulation should be non-eroding & should pass Air Erosion Resistance Test in accordance to ASTM Standard C 1071-05 (section 12.7).
- The material should have a thermal conductivity not exceeding 0.047 W/m.K @ 20 Deg. C
- The material should withstand maximum surface temperature of +850C and minimum surface temperature of -200C
- The material should confirm to Class 1 rating for surface spread of Flame in accordance to BS 476 Part 7 & UL 94 (HBF, HF 1 & HF 2) in accordance to UL 94, 1996.
- The acoustic insulation should be tested and approved by Sound Research Laboratories Ltd., U.K.
- Thickness shall be 10mm for Duct Acoustic Lining
- Duct so identified and marked on Drawings and included in Schedule of Quantities shall be provided with internal acoustic lining for a distance of minimum 6 meters (or 30% of the duct length whichever is more)
- Thickness of the insulation material shall be as specified for the individual application. The insulation should be installed as per manufacturer's recommendation.

7.7 Accessories

Adhesive to adhere insulation to the inside walls of the duct shall be from the Insulation manufacturer only.

7.8 Under deck insulation

- ☐ Insulation material shall be Closed Cell Elastomeric Nitrile Rubber
- ☐ Density of Material shall be between 40 to 60 Kg/m³
- ☐ Thermal conductivity of elastomeric nitrile rubber shall not exceed 0.035 W/m²K at an average temperature of 0°C
- ☐ The insulation shall have fire performance such that it passes Class 1 as per BS476 Part 7 for surface spread of flame as per BS 476 and also pass Fire Propagation requirement as per BS476 Part 6 to meet the Class 'O' Fire category as per 1991 Building Regulations (England & Wales) and the Building Standards (Scotland) Regulations 1990
- ☐ Material should be FM (Factory Mutual), USA approved.
- ☐ Water vapour permeability shall not exceed 0.017 Perm inch (2.48 x 10⁻¹⁴ Kg/m.s.Pa), i.e. Moisture Diffusion Resistance Factor 'μ' value should be minimum 7000.

7.9 Installation procedure:

- ☐ The ceiling surface shall be cleaned with brush to remove all dirt, cement etc. If surface is uneven it should be made smooth prior to carrying out insulation work.
- ☐☐ A layer of synthetic rubber adhesive should be applied on the ceiling with the help of brush so that all the pores are filled and surface becomes smooth and allow it to dry.
- ☐ Allow an additional 5 mm to the total dimensions while cutting Insulation sheet. Ensure you measure the cutting dimensions on the top surface of the insulation sheet. This can be identified by the products markings; "they are always on the top surface. This surface is the one you will see after installation.
- ☐ All Insulation sheet and ceiling surfaces shall have all-over adhesive coverage. Adhesive should be applied on the side that has no product markings and identification printing. This side is the one that curves inwards.
- ☐ During installation avoid air bubbles. Always apply pressure while fixing the Insulation sheet, this action will ensure maximum bond strength.
- ☐ All cut Insulation sheet edges shall be of a "clean cut nature and not cut rough".
- ☐ All seams and joint shall be sealed with synthetic rubber adhesive.
- ☐ Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubbers sheets to size with sufficient allowance in dimension. Material shall be fitted under compression and no stretching of material shall be permitted. A thin film of adhesive shall be applied on the ceiling with brush and then on to the back of the insulating material sheet with brush/small piece of sheet metal having smooth edges. When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. All joints shall be sealed. The adhesive shall be strictly as recommended by the manufacturer. There is no need to make holes for wires etc. as no supporting wires/screws are required.

While doing installation on the metal roofing, it is important to ensure that metal roof should not face direct sun light, as metal sheets becomes very hot and adhesive may not work. In such conditions work should be done in the evening / night

8. FIRE DAMPERS

This section deals with supply, erection, testing and commissioning of fire dampers and box type dampers, conforming to general specification and suitable for duty selected, indicated in schedule of equipment/material.

8.1 Dampers

- a) The fire dampers of at least two hour rating shall be provided in all return air ducts at wall crossing. All fire dampers shall be fire tested by CBRI Roorkee for 120 minutes fire rating as per UL555-1995.
- b) 6G GSS sheet blade and frame with 165mm casing, heavy duty interlocking blades and fully enclosed blade linkage mechanism, SS lateral seal blade seals, self lubricating sintered bronze bushes, fire rating as per UL555-1995 tested as per BS-476 part 20 with 18G extended sleeve 450mm and with fusible link, spring mechanism control panel temp sensor, smoke sensor, limit switch with lever for auto shut off in case of fire/smoke
- c) In the normal position the blades of the dampers shall remain open to allow maximum air to flow. The dampers shall be actuated using fusible link and spring mechanism. The fire damper shall also close due to temperature rise above 74°C.
- d) All fire dampers shall be mounted on wall with a duct sleeve 400 mm long depending on the wall thickness. The sleeve shall be factory fitted on the fire damper. The joint at the sleeve end shall be slip on type. Minimum thickness of GI sheet used for sleeves shall be 18G.

8.2 Exhaust Air Blowers

line exhaust air flow duct blowers suitable for single phase operations with direct driven class F motor, IP 54 insulation, max 1400rpm, necessary steel frame, and complete with GI box, with an operating sound level not exceeding 60dB at 3m distance.

9 PAINTING WORK

9.1 All equipment shall be painted as specified under respective headings. Grilles/ diffusers shall be powder coated as per approved colour matching with interiors. The contractor has to get approval of the quality and colour of paints for all types of painting work. All pipes for chilled water shall be painted as per standard code of practice and arrows indicating direction of flow of water shall be marked.

9.2 Colour scheme for the plant and equipment

- i) Compressor .. Battle ship grey
- ii) Condenser .. Battle ship grey
- iii) Refrigerant discharge line .. Red
- iv) Refrigerant liquid line .. Yellow
- v) Steel supports .. Black
- vi) Direction of flow of water .. White arrows
- vii) Electrical panels/sub-panel/remote control console .. Light grey or any approved
- viii) Cable trays .. Black
- xi) Supports for ducts/open ducts .. Black.

MODE OF MEASUREMENT-HVAC

THE FOLLOWING MEASUREMENT CODE SHALL BE APPLICABLE.

1 MECHANICAL ITEMS

1.1 Ducting

- i) All sheet metal ducting work shall be measured in terms of final sheet area installed in Sq. m.
Eg:- Measurement of 600 mm x 300 mm duct of 1 m length = $\frac{((600+300) \times 2 \times 1)}{1000}$
= 1.80 Sq.m.
- ii) Duct fittings such as bends, elbows, tap-offs, collars, transformation pieces etc. shall be treated as ordinary duct pieces with their length measured along their centre line as mentioned in point (i).
- iii) Vanes, splitters, duct dampers, deflectors, access doors, etc. which are required to be installed in the duct work shall not be measured separately as it shall form part of the duct work.
- iv) Duct supports, stiffening members, etc. shall not be measured separately. All such supports/hangers shall form part of duct work.
- v) Equipment connections such as canvas/asbestos/rexine shall be deemed to be part of the duct work, and no separate measurement shall be allowed.
- vi) No separate special measurement shall be made for bends, transformation pieces, tap offset, elbows, etc.

1.2 Grilles:

All grills will be measured in terms of effective area in Sq.m.

1.3 Diffusers:

Diffusers will be measured in terms of effective area in Sq.m.

1.4 Ducting Insulation

d) Ducting insulation will be measured on the basis of centerline of insulation and not the outer line of insulation.

Eg:- Measurement of 25mm thick insulation on 600 mmx300mm duct of 1m length = $(((600+25)+(300+25))/1000] \times 2 \times 1]$ Sq.m

ii) No separate special measurement shall be made for insulation of bends, transformation pieces, tap offs, elbows, etc. All such insulation shall be treated as standard duct insulation.

iii) Insulation item shall include all accessories and finishes as specified. No separate measurement will be made for such items.

2 Electrical items

Mode of Measurement of Electrical Items

The Works shall be measured, as prescribed in the specification of work, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract. Wherever not specifically mentioned in the Contract, the mode of measurement as prescribed in the relevant IS codes shall be applicable and binding to the Contract. Only the latest editions of all the codes of practices including all latest official amendments and revisions shall be applicable.

TESTING OF AIR-CONDITIONING SYSTEM

1. Routine and type tests for the various items of equipment of the system shall be performed at the Contractor's own cost and test certificates are to be submitted.
2. The contractor shall operate, test and adjust the air-conditioning system units, fan, motors, all air handling appliances including adjustment of regulators, dampers, etc. All testing equipments, labour, operating personnel, oil, refrigerant or any other item required for these tests shall be provided by the contractor to enable the plant to be put in a continuous running test. Any rectifications required shall be carried out by the Contractor to tune the system for satisfactory performance as per requirements.
3. The contractor should conduct performance such tests as indicated in the rated Technical Part and produce sufficient documentary proof that the equipments are operating at the rated capacity.

30kVA UPS & BATTERIES

The Scope of work includes design, manufacture, supply, installation, testing, commissioning and maintenance of 30kVA UPS suitable for three phase input and three phase output with back-up time of 30mins.

The UPS shall be housed in a free standing enclosure. Battery housing cabinet to be supplied. d)

Inverter/Battery charger: The inverters shall be a high-speed insulated gate-bi- polar transistor switch module type (IGBT) and shall be controlled to precisely regulate system output voltage and battery charge current. The inverters shall be temperature protected. In case of inverter over temperature, the unit shall activate an alarm and automatically transfer to static bypass operation.

The UPS manufacturer shall warrant the UPS module against poor workmanship and materials for 2 years from the date of supply (Defects Liability Period). The warranty shall include coverage of all internal parts and the supporting equipment.

Rating	:	30kVA
Technology	:	online-Double Conversion with Digital Signal Processor control, Should have IGBT based PFC Rectifier and IGBT based Inverter
Input		
Nominal Voltage	:	415V AC, 3 Ph + N (+/-15%)
Nominal Frequency	:	50Hz (+/- 3%)
P.F	:	0.9
Batteries	:	SMF Batteries should be sized for back-up of 30mins at full load, Battery manufacturer's catalogue and stacking details to be provided, Battery racks should be provided.
Output		
Voltage	:	415V AC, 3 Ph + N (+/-1%)
Frequency	:	50Hz
Power Factor	:	0.8 TO UNITY
Waveform	:	Pure Sinusoidal
THD	:	<1% max for 100% linear load
Regulation	:	+/- 1% under all line and load conditions
Inverter Efficiency	:	>90%
Overload Capacity	:	120% FOR 10 MINS
Transient Response	:	+/-5 % OF NOMINAL OUTPUT VOLTAGE FOR STEP LOAD CHANGE FROM 10%
Transient Recovery	:	WITHIN 1 CYCLE TO REGULATION BAND
Galvanic iso. transformer	:	200A
Crest factor	:	3:1 OR BETTER
Noise	:	LESS THAN 55 DB
Display Unit	:	Digital display (LCD/LED)
Ventilation	:	The UPS shall be cooled by forced air and shall be equipped with fan monitoring circuits. External battery systems shall be cooled by free-air ventilation and

convection according to battery manufacturer requirements.

Static bypass switch	:	The static bypass switch shall be solid state, rated for continuous duty. The static bypass switch shall automatically transfer the critical load to mains supply without interruption after the logic senses one of the following conditions:
Indications & Alarms	:	<ul style="list-style-type: none">• MAINS ON• MAINS FAIL• BATTERY CHARGING• BATTERY CHARGED• RECTIFIER TRIP• INPUT OVER VOLTAGE• INPUT UNDER VOLTAGE• INVERTER ON• BATTERY LOW• OUTPUT OVER VOLTAGE• OUTPUT UNDER VOLTAGE• OUTPUT OVER LOAD
Protections	:	<ul style="list-style-type: none">• INPUT OVERVOLTAGE• INPUT UNDER VOLTAGE• DC OVER VOLTAGE• INPUT OVER CURRENT• BATTERY OVER CHARGING• BATTERY LOW OUTPUT• OVER VOLTAGE• SHORT CIRCUIT
Operating temperature	:	0 to 40 deg. C
Storage temperature	:	0 to 50 deg. C
Relative Humidity	:	upto 95%
Comm. Interface	:	RS 232

LIST OF APPROVED MAKES

List of Approved makes for the works is given below. Other equivalent manufacturers may be considered with prior approval; however the decision of the Engineer-in-charge shall be final.

ELECTRICAL

1	Switch Fuse Unit (HRC Type)	Schnider/GE/L&T/Siemens/C&S/Havells
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2	MCB's, MCCBs, RCCBs, ELCB's & MCB DBs	Legrand / L&T /Siemens / Havells / C&S / Schneider / GE / Hagger / Anchor / Standard
3	LT XLPE Aluminium Armoured cables upto 1100v	Polycab/ Havells/ National/Ralison/Paragon
4	HT XLPE Aluminium Armoured cables upto 11000V	Polycab/ National/INCAB/
5	Air Circuit Breakers	Schneider/ GE /L&T/Siemens
6	Terminals	Elmex /Technoplast
7	Lugs	Dowells/ Ismal
8	Glands	Gripwell/ Comet
9	Indicating lamps	L &T/ Siemens/Technique
10	Power factor correction relay	Syntron/ Avomec/Sigma/
11	Indicating Instruments	L&T, AE, IMP, MECO
12	KWH Meters	L&T/HPL SOCOMEC
13	Current Transformers	AE/ Kappa
14	Selector Switches	Salzer-L&T/ Kaycee
15	Change over switches	HH Elecon/HPL
16	USS/ Transformers/ HT Switch gear	Intrans/ Voltamp/ Kirloskar
17	RMU	CG Lucy
18	HT Jointing Kits	Raychem/ Mahindra/Denson/Cabseal
19	LT Panels	CPRI tested & approved
20	Power Capacitors	Crompton/Siemens Apcos/Khatou
21	HRC Fuse Base & HRC Fuses	L&T/GE/Schneider/HPL
22	Metal Pipes	Jindal, Zenith, Tata, Surya,
23	Lighting Fittings & Luminaries	Crompton/Philips/Wipro/BAJAJ/Havell's
24	PVC insulated 1.1KV grade copper wires	RR Kabel/ National/Ralison/RKG/Finolex/Polycab / Havells
25	Piano/Modular Type Sockets & Switches	Roma(Anchor)/Legrand/MK/Crabtree/

HVAC

1.	AC Condensing Outdoor Units/Ductable Units /Split AC	Blue star/ Voltas/ Carrier /Hitachi/ ETA/Daikin/Samsung/General
2.	AC Compressor	Danfoss/Koplan/Emerson
3.	AC AHU's& IDU's	Blue star/ Voltas/ Carrier/ Edgetech/ ETA/ Daikin/ General/ VTS/ Zeco
4.	De-humidifier	Bry Air/Dessicant Rotor
5.	Air- curtain	Almonard, Russel
6.	Copper Pipes	Totaline/Mandev/Piyush
7.	Three phase motors	Siemens/Kirloskar/Crompton/Bharath Bijlee /ABB /Alsthom
8.	Aluminium Conductor Cables	Finolex/NICCO/Havells//Gloster
9.	Stabilizer	V Guard/VOLTAS/Everest
10	GI/Al Sheets	SAIL/TATA/JINDAL/HINDALCO/NACL
11	Resin bonded Glass wool	UPTWIGA /Owens Coning/KIMMCO
12	Nitrile Rubber Insulation	Armaflex/K Flex
13	Grilles/Diffusers	Airmaster/ Carryaire/ Cosmic/ Air Flow/Ravistar
14	Pressure gauges	Feibig/H-Guru/Jaspin
15	Industrial type thermometers	Feibig/H-Guru/Jaspin
16	Fire/Volume Control Dampers	Carryaire/ Airmaster/ Air Flow/ Ravistar
17	Exhaust/ Duct Fans	System Air/Kruger/Nicotra/ Almonard
18	Paints	ICI/Asian/Berger
19	PVC pipe	Any ISI marked
20	Hepa Filter	Aerofoil/Pyramid/AAF/Thermodyne
21	Valves	Audco, Leader, Kirloskar, Advance,

PROFORMA FOR PREQUALIFICATION OF CONTRACTORS

I. General Information

1) Name of the firm :

2) Address :

3) Contact person :

Phone

Fax

Email

Cell Phone

4) Place and year of :

Incorporation of the firm

5) Registration No. :

(Copy to be enclosed)

6) Constitution of the firm :

(Pvt. Ltd., Public, Proprietary)

7) Name & qualification of the Chief :

Executive of the firm

II. Organization Structure of the Firm

Technical Chief of the Organization

a. Name :

b. Designation :

c. Address :

d. Telephone :

Fax

Email

Cell Phone

e. Qualification :

f. Age :

III. a) Details of Top Technical Personnel to be provided as in II above.

b) Details of Field/Supervisory Staff to be provided as in II above.

IV. Details of Projects handled of similar type

1) Details of completed projects for :*(Furnish as per format of Annexure I)*
the last 3Years.

(Completion certificates shall be enclosed)

2) Details of ongoing projects :*(Furnish as per format of Annexure II)*

3) Information on works for which :*(Furnish as per formats of Annexure III &*
bids have been submitted and *IV)*
are yet to be completed as on

4) Details of Machinery, Tools and Measuring :*(Furnish as per format of Annexure V)*
equipment owned (form enclosed

5) Details of Key Personnel :*(Furnish as per format of Annexure VIII)*

V. Financial Information

1) Turn over for the last 3 years : *(Furnish as per format of Annexure VI)*

2) Permanent Account No. (IT) :

3) Tax Identification No. (TIN) :

4) Service Tax Registration No. :

5) Audited balance sheet and P&L Statement during :
the last 3 years

(Enclose copies for the last three years)

7) Whether any legal cases specific
for supply, installation, testing and
commissioning of Elevators are : *(Furnish as per format of Annexure Vii)*

pending against the firm during the
last five years, Please furnish
details

Annexure I

(Sample Format)

Details of completed projects in the previous year with minimum outlay as per eligibility criteria.

Project name	Name of the client	Description of work (type of Building)	Contract No.	Value of Contract (RS. in Lakh)	Date of Work Order	Stipulated period of completion	Actual period of completion	Remarks, Explain reasons for delay, if any

Enclose satisfactory completion certificate and date of completion from the concerned Engineer-in-charge not below the rank of Executive Engineer in the case of Govt. or Chief executive in the case of Private Organization. Completion certificates for works issued by private parties shall be supported by TDS certificates

SIGNATURE OF BIDDER

Annexure II

(Sample Format)

Details of ongoing projects

(Refer Para IV (2) of the format)

Project Name	Name of the Client	Description of work	Contract No.	Value of Contract (Rs. in lakh)	Date of Work Order	Stipulated period of Completion	% progress achieved	Remarks

Enclose a progress certificate from the concerned Engineer-in-Charge not below the rank of Executive Engineer in the case of Govt. or Chief Executive in the case of Private Organization.

SIGNATURE OF BIDDER

Annexure III*(Sample Format)***A) INFORMATION ON WORKS WITH EXISTING COMMITMENTS**

Description of Work	Place and State	Name and address of Client	Value of Contract (RS. in lakh)	Stipulated period of completion	Remarks

SIGNATURE OF BIDDER**Annexure IV***(Sample Format)***B) TENDERS SUBMITTED BUT PENDING FINALISATION**

Description of Work	Place and State	Estimated value of works (Rs. in lakh)	Stipulated period of completion	Date when decision is expected	Remarks

SIGNATURE OF BIDDER

Annexure V

(Sample Format)

Details of Machinery, Tools & Equipment/ Measuring Equipment owned.

Name of Equipment	Nos.	Capacity/Size	Age/Condition

SIGNATURE OF BIDDER

Annexure VI

(Sample Format)

Turn Over for the last 3 years

Sl.No.	Year	Turn Over (Rs. in crore)	Remarks
1.	2015-16		
2.	2014-15		
3.	2013-14		

SIGNATURE OF BIDDER

Annexure VII

(Sample Format)

Details of legal cases pending against the firm during the last three years

Sl. No.	ORGANISATION AGAINST WHOM THE LITIGATION IS INVOLVED	BRIEF DETAILS OF DISPUTE	AMOUNT INVOLVED (Rs.)	PRESENT STATUS	Remarks

SIGNATURE OF BIDDER

Annexure VIII

(Sample Format)

Details of Key Personnel to be provided for the work

Sl. No.	Key Personnel	Name & Qualification	Years of Experience
1.			
2.			
3.			
4.			
5.			

- HLL shall have the right to demand augmentation of the staff if required.

SIGNATURE OF BIDDER