HLL INFRA TECH SERVICES LIMITED (HITES)

(Subsidiary of HLL Lifecare Limited
A Government of India Enterprise)

RE-TENDER

FOR

SUPPLY, INSTALLTION, TESTING AND COMMISIONING OF AIRCONDITIONING SYSTEM FOR LABS AND FACULTY ROOMS AT JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION AND RESEARCH (JIPMER), PUDUCHERRY, INDIA.

Volume- III

TECHNICAL SPECIFICATION

Tender Notice No. : HITES/FM/JIP/ADD-PROJECT/2019-20/005 Dated: 20.12.2019

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TECHNICAL SPECIFICATIONS

A BRIEF OF REQUIREMENT OF THE WORK:

1. **General Scope of Work :**

   2. Providing Air conditioning system to labs & faculties, JIPMER, Puducherry.

   3. **The following are the salient features of the Works:**

      a. Supply, Installation, Testing & Commissioning of air conditioning system.

      b. Providing Electrical Connection to the air conditioning system.

4. The work shall, in general, conform to the Latest CPWD Specifications for Electrical and Mechanical works with up to date correction slips for all sub heads of work as applicable, and, Technical Specifications included in the tender documents, wherever applicable. Wherever any aspect of design / construction / material standards is not covered under the above mentioned specification, relevant standards shall be referred to in the order of precedence which shall be as follows. In the case of discrepancy between the Schedule of Quantities, the Specifications and /or the Drawings, the following order of preference shall be observed –

   a. Description of Schedule of Quantities.

   b. Particular specification and Specific Condition, if any.

   c. CPWD Specifications.

   d. Indian Standard Specifications of BIS/ NBC/ IRC/ BS/ ASTM/ DIN.

TECHNICAL SPECIFICATIONS - MECHANICAL

1. GENERAL SPECIFICATIONS

1.1 SCOPE OF WORK

The complete scope of work shall cover providing and fixing Air Conditioning System at JIPMER Puducherry which includes installation of Split AC and its outdoor units with Copper pipes routing, Laying drain pipe, providing Stabilizer, Indoor to outdoor cabling and civil works. The contractor shall submit the design & drawings for approval and obtain approval from Consultant/Client before commencement of works.

1.2 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.

1.3 Terms and Definitions

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

1) BIS- Bureau of Indian Standards
2) ASHRAE- American society of Heating, Refrigeration and Air-conditioning Engineers, USA.
3) ASME - American Society of Mechanical Engineers.
4) ASA- American Standard Association.
5) B.S -British Standards
6) CMH -Cubic Meter per Hour
7) CFM- Cubic Feet per Minute
8) US GPM US Gallons per Minute
9) IGPM - Imperial Gallons per Minute.
10) RPM- Revolutions per Minute
11) BTU/Hr. British Thermal Unit per Hour
12) KCal/Hr. Kilo Calories per Hour
13) HZ Hertz
14) H.P. Horse Power
15) Kg/CM2 Kilo Gram per Square Centimeter
16) SG - Supply Air Grilles
17) SD- Supply Air Diffuser
18) SAF- Supply Air Filters
19) FD- Fire Damper
20) VCD - Volume Control Damper
21) RG - Return Air Grilles
22) RD - Return air diffuser
23) FAD - Fresh Air Damper
24) RH - Relative Humidity

25) DB - Dry Bulb Temperature
26) WB - Wet Bulb Temperature
27) MV - Mechanical Ventilation
28) DP - Drain Point.
29) 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.

1.4 Safety Codes

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

1.5 MACHINERY
AIR CONDITIONING UNIT

1) **Compressor**
All compressors shall be hermetically sealed scroll type of suitable capacities. Compressor shall be suitable for R410 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.

2) **Outdoor Unit**
The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be OEM's standard design), constructed from heavy gauge GI sheets/rust proof mild steel in duly enamel/powder coated paint finished steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.

3) Evaporator coil
The coils shall be made of copper hydraulically bonded with aluminum fins. The coils shall be hydrophilic in nature.

4) **Condenser motor**
The condenser motor shall be of IP-55 rating.

5) **Refrigeration piping and accessories**
All refrigerant piping for the air conditioning system shall be constructed from soft seamless copper pipe with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice and within the air conditioning industry, and are to include charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits. All joints in copper piping shall be sweat joints using low temperature brazing and or silver solder. Before joining any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while constructing the joints. Subsequently, it shall be thoroughly blown out using nitrogen. After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 5Kg per sq.cm for both high and low side. Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum of 700mm hg and held for 24 hours. The air-conditioning system supplier shall design sizes and erect proper interconnections of the complete refrigerant circuit

6) **Drain Piping**

Drain pipe shall be of 32mm dia. PVC pipes. All Cassette 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.

7) **Filters**
All evaporator units shall be provided with air filters capable for filtration unto 20 microns. The filters shall be of washable synthetic fiber type.

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

9) **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.

10) **Testing**
A/C units after installation shall be tested for its conformity to specifications. Units shall also be tested for the rated capacity and power consumption.

11) **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.

1.6 THERMAL / ACOUSTIC INSULATION

1.6.1 Material

1) Insulation material shall be Closed Cell Elastomeric Nitrile Butadiene Rubber.
2) 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.
3) 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.
4) Thermal conductivity of Elastomeric Nitrile rubber shall not exceed 0.035 W/m□K at an average temperature of 20□C in accordance to EN12667
5) 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

6) 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 EN12086.
7) Density of Material shall be between 40 to 60 Kg/m3.

1.6.2 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:

1.6.3 Recommended Adhesive

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

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.

5. 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 performance tests to determine whether or not the full intent of the specification is met shall be conducted by the contractor. After notification to Purchaser that the installation has been completed and the system has run continuously for a period of at least one week, the contractor shall conduct under the direction and the presence of Purchaser such tests as specified to establish the capacity of various equipment supplied and installed by the contractor.
3) The contractor shall operate, test and adjust the air-conditioning system units, fan, motors, all air handling appliances 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.

4 **TEST PROCEDURE**:

4.1 Design Conditions:

The inside and outside conditions shall be recorded on hourly basis. The outside and inside dry bulb and wet bulb temperatures shall be recorded by means of a sling psychrometer with mercury thermometers. The relative humidity shall be computed from the psychometric chart. The inside dry bulb temperature and relative humidity shall fall within the specified limits.

The contractor should conduct performance such tests as indicated in the rated Technical Part and produce sufficient documentary proof that the plant is operating at the rated capacity.

4.2 The following readings shall be recorded hourly during the tests and capacity of the plant shall be computed.

Compressor			
a.	Suction pressure	Kg/cm^2 (psi)	
b.	Suction temperature	^{o}C (^{o}F)	
c.	Discharge pressure	Kg/cm^2 (psi)	
d.	Condensing Tempr.	^{o}C (^{o}F)	
e.	Oil pressure	Kg/cm^2 (psi)	
f.	Compressor Speed	RPM	

Compressor motor			
a	Rated capacity		
b	Rated volts		
c	Rated current		
d	Starting current		

Inside unit			
a.	Air velocity	M/Hr. (FPM)	
b.	Face area	M^2 (SFT)	
c.	Air quantity	M^3/Hr. (CFM)	
d	Entering air temp. DB		
e	Entering air temp. WB		
f	Leaving air temp. DB		
g	Leaving air temp. WB		

Filters			
a	Total area		
b.	Effective area		
c.	Velocity of air		
d	Quantity of air		

5. TECHNICAL DATA

Technical Data Split			
1	Model No.		
2	Manufacturer		
3	Cooling Capacity		

4	Compressor type		
5	Suction pressure		
6	Discharge pressure		
7	Rated Power Supply		
8	Total Power Input		
9	COP		
10	Current drawn		
11	Fan Speed		
12	Air Flow		
13	Sound level (DB)		
14	Dimensions (IDU)		
15	Dimensions (ODU)		
16	Dimensions (panel)		
17	Refrigerant		
18	Refrigerant pipe size		
19	Net Weight		

Note : Any other data relevant to each equipment shall also be furnished.

6. PARTICULAR SPECIFICATIONS

2.1 For new items for which specifications are not available as stated above, the specifications decided by the Engineer-in-charge based on the contractor. Where materials are specified by reference to brand and make names and use of their equivalents permitted use of such equivalents shall only be allowed after the contractor satisfy the Engineer-in-charge that at the appropriate time, material of the brand or make specified are not available, and the adequacy or the equivalent materials.

List of Approved Makes of Materials

S.No	Details of equipment/ material	Make / Manufacturer
1.	Split AC	Blue star/ Carrier /Hitachi/Daikin/ Voltas
2.	Copper Pipes	Totaline/Mandev/Piyush
3.	Copper Conductor Cables FRLS	Finolex / Havells/ Polycab
4.	Stabilizer	V Guard/VOLTAS/Everest
5.	Nitrile Rubber Insulation	Armaflex/K Flex
6.	PVC pipe	Any ISI marked
7.	Metal Clad Box, MCB	Legrand, Norwood, L&T
8	Module Plate, Cover, Box, Switch	Legrand, Crab tree, Anchor