

TENDER DOCUMENTS FOR AIR CONDITIONING WORK AT

STATE BANK OF INDIA,

ZANZARDA ROAD, DIST. JUNAGADH.

TENDER ISSUED TO : M/s _____

INDEX

No.	Contents	Page
1.	Cover page	01
2.	Index / Memorandum	02 - 20
3.	BOQ of A.C Work	21

MEMORANDUM

- | | | |
|-----|------------------------------|---|
| (a) | Description of works: | Internal AIR CONDITIONING work for State Bank of India, ZANZARDA ROAD Branch, Dist. JUNAGADH |
| (b) | Date of Commencement: | Either one week from the date of acceptance letter or the day on which contractor is instructed to take possession of the site. Whichever is earlier. |
| (c) | Time allowed for completion: | 4 Weeks from the date of commencement of the works from the date of work order. |
| (d) | E. M. D.: | Demand Draft of Rupees 2700/- in favor of SBI C. M. (Admin), REGION-4, JUNAGADH, Cheque will not be accepted. |
| (e) | Defect Liability Period | One year from the date of satisfactory completion of work. |
| (f) | Retention Amount | 5% Amount of total work order will be kept as retention amount and will be released after one year of successful completion of the work. |

A. Last Date & time for issue of tender 23.03.2017 During Office Hours.

B. Last date of receipt of tenders : **31.03.2017**

To,
C. M. (CS&CH)
STATE BANK OF INDIA
REGIONAL BUSINESS OFFICE -4,
3RD FLOOR, Merrygold,
Opp. Bahudddin college,
Junagadh-362001.

C. Date & time of opening of tenders :--

AT THE OFFICE OF:-

To,
C. M. (CS&CH.)
STATE BANK OF INDIA
REGIONAL BUSINESS OFFICE -4,
3RD Floor, Merrygold
Opp. Bahuddin College,
Junagadh-362001.

I / We confirm that the best of our knowledge this information is authentic and accept that any deliberate concealment will amount to disqualification at any stage.

Seal and Signature of the Bidder / s.

DATE :

PLACE:

PART-A	3	SIGNATURE OF CONTRACTOR
---------------	----------	--------------------------------

TECHNICAL SPECIFICATIONS

2101	UNITARY REFRIGERATION EQUIPMENT	2101 / 01 -03
2102	AIR DISTRIBUTION	2102 / 01 -06
2103	THERMAL INSULATION	2103 / 01 - 08
2104	MAKES OF MATERIAL	2104 / 01 – 02
2105	REFERENCE DRAWINGS	2105 / 01

2101 UNITARY REFRIGERATION EQUIPMENTS

01.00.00 **SCOPE**

01.00.01 The scope under this section shall cover the unitary refrigeration equipments such as window air conditioners, split units and packaged units.

02.00.0 STANDARDS

02.00.01 The following standards shall be applicable

- a) IS : 4283 Hot air fans
- b) IS : 8272 Industrial cooling fans
- c) IS : 1391 Room Airconditioners
- d) IS : 8148 Packaged Air conditioners
- e) IS : 2997 Air circulator type electrical fan and regulator

03.00.00 **GENERAL REQUIREMENTS**

03.00.01 The unitary air conditioners shall include refrigeration compressor, drive motor, air cooled condensing unit, evaporator, refrigeration piping automatic control system enclosure etc.

03.00.02 The equipment assembly shall be well balanced to achieve minimum vibration and noise. The condensing unit mounted outdoor shall be suitable for the climate and atmosphere condition prevailing to avoid / minimize corrosion . Necessary anti corrosive treatments shall be provided for the metallic components.

03.00.03 The equipments shall meet the requirements indicated in the equipment data and shall meet the cooling load specified at the outdoor design data furnished and the distance / static head between the outdoor and the indoor units.

04.00.00 **EQUIPMENTS**

04.01.00 Assembled Units

04.01.01 The unitary air-conditioning units shall be of factory assembled and tested and of the following category as indicated on the drawing and bill of materials.

- a) Window air conditioners having single unit to house compressor, condenser, evaporator refrigerant piping and control system.
- b) Split air conditioners having compressor and condenser housed in one unit located outdoor evaporator and controls house in another unit located indoor.

Refrigerant piping and power / control wiring interconnecting condensing unit and evaporators laid externally

- c) Packaged air conditioners having compressor and control evaporated houses in one unit and located indoor and condenser housed in another unit located outdoor . The refrigerant piping and power/control cabling interconnecting condenser and the indoor unit laid externally.

04.01.02 The components for the various equipment assembly shall be as specified in the following section.

04.02.00 COMPRESSORS

04.02.01 The compressors shall preferably be hermetically sealed scroll permanently lubricated.

04.03.00 CONDENSERS

04.03.01 The condenser shall be air cooled consisting of copper coils with aluminum fins, propeller fan with motor, sheet steel enclosure with air inlet and exhaust louvers mounting frame, platform/ brackets etc.

04.03.02 The condenser and all its components shall be provided with suitable anticorrosive treatment. The enclosure shall be GI /Aluminum powder coated.

04.04.00 EVAPORATOR

04.04.01 The evaporators shall be ducted or non-ducted concealed or exposed as indicated in the drawing and bill of materials. The evaporators shall include copper coils with aluminum fins, expansion valve, centrifugal fan with motor return air filter, supply and return air grilles and louvers, automatic control panel with thermostat and enclosure. The enclosure for concealed unit shall be of GI powder coated whereas that for exposed units shall be of ABS plastic.

04.04.02 The filters shall be antibacterial washable and shall be of minimum 20 micron filtration. The filters shall be easily removable for cleaning without.

04.05.00 CONTROLS

04.05.01 The controls shall be automatic digital electronic LCD display having the following minimum requirements.

- a) Automatic capacity control
- b) Temperature and fan speed control with digital display
- c) Timer control
- d) Corded /corded remote control wherever specified.

04.05.02 The control system features shall be as shown below :

Sr.No.	Feature	Standard	Regular	Deluxe
1	Type of control	Unit Mounted	Remote	Remote
2	Type of Remote Control	Corded	Cordless	
3	Temperature Setting	Yes	Yes	Yes
4	Fan Speed Selection	Yes	Yes	Yes
5	Timer Control	Yes	Yes	Yes
6	Digital Display	Yes	Yes	Yes
7	Delayed Starting	Yes	Yes	Yes
8	Filter Cleaning Indicator	No	Yes	Yes
9	In built – ON /OFF	No	No	Yes
10	Quick Cooling Mode	No	Yes	Yes
11	Auto reset	No	No	Yes
12	Auto fan speed	No	No	Yes
13	Night set mode	No	Yes	Yes
14	Self Diagnosis	No	No	Yes

05.00.00 SUPPORTS & PIPING

05.01.00 Supports & Brackets

05.01.01 The equipment's shall be properly supported with brackets, hangers, platforms base frame etc. depending upon the type, location and capacity of the unit.

05.01.02 The supports shall be MS fabricated duly treated and painted for anticorrosion. The outdoor condensing units shall be properly supported on MS frame work/ platform properly grouted to the RCC Slab / brick walls using bracket.

05.01.03 The floor mounted packaged unit shall be provided with base frame and pedestals with necessary ant vibration pads. The ceiling suspended evaporator shall be supported using anchor fasteners and suspension rods. The wall-hung evaporators shall have GI stenciled back plate for mounting the unit, grouted to the wall/beam using anchor fasteners.

05.02.0 REFRIGERANT PIPING

05.02.01 The refrigerant piping shall be of half – hard copper RS 250 conforming to EN .1057 Table Y. The fittings shall be of shot end capillary brazing conforming to EN 1254. The pipes shall be supplied on coils and cut to required length to achieve fall length without joints between the condenser and evaporator.

05.02.02 The fittings for connection to the condenser evaporator expansion valve etc shall be through copper – brass composite fitting. The brazing / soldering material shall conform to EN. 29453.

05.02.03 The refrigerant lines shall be insulated with 9mm Nitride rubber tubing to prevent heat loss and condensation .

Refrigerant piping running along the partition wall shall be concealed in the wall with necessary chasing in the wall and closing the same with sand cement plastic with chicken wire mesh.

05.03.00 DRAIN PIPING

05.03.01 The evaporator shall be piped to the nearest drain point / drain line using UPVC pipe conforming to 4985 . Necessary water seal trap shall be provided at the evaporator at the discharge point.

2102 AIR DISTRIBUTION

01.00.0 SCOPE

01.00.01 The scope under this section covers air distribution system consisting of :

- a) Sheet metal ducting
- a) Dampers & Air balancing
- b) Grilles and diffusers

02.00.00 STANDARDS

02.00.01 The following standards shall be applicable:

- a) IS: 655 Metal air ducts
- b) IS: CP352 Mechanical ventilation and air conditioning in buildings
- c) IS: 2629 Recommended practice for hot-dip galvanizing of iron & steel
- d) SMACNA Standard for low-pressure duct construction

03.00.00 MATERIAL

03.00.01 The material for sheet metal ducting shall be cold rolled sheets continuous galvanize with Zinc coating of total 180 gm per SQ.MT for conforming to IS: 277.

- 03.00.02 The gasket for duct joints shall be 3mm formed rubber or expanded polyethylene. The bonding material shall be mastic sealant.
- 03.00.03 The duct flanges and supporting material shall be mild steel structure steel section.
- 03.00.04 All duct hangers shall be mild rod with threaded end with adjustable nuts for levelling.
- 03.00.05 The material for various applications shall be as follows.

APPLICATION	MATERIAL
1. Ducting for Air-conditioning	Cold rolled sheets continuous galvanized with a zinc coating of 180 g/sq.m conforming to IS : 277 a) Indoor – Class 4 b) Outdoor insulated-Class 4 c) Outdoor un insulated-Class 3
2. Duct for ventilation & exhaust	- do –
3. Kitchen exhaust	C.R.C.A sheet
4. Supports & duct flanges	Mild steel structural steel sections
5. Gasket	Foamed rubber 3.2mm (1/8")
6. Bonding	Master sealant

- 03.00.06 All galvanized plain sheets shall be reasonably flat and free from twist. The zinc coating shall be clean, even and free from un galvanized spots. Sheets shall not crack or peel during bending or fabrication. All sheets shall be procured from approved manufactures.

04.00.00 GENERAL REQUIREMENTS

- 04.00.01 The sheet metal ducting shall be done for the proper distribution of air in air-conditioned/ventilated space. The ducting shall be designed on the basis of equal pressure drop and shall incorporate necessary accessories like reducers, bends, splitters, dampers and guide vanes for proper control and smooth air flow.
- 04.00.02 The selection of air diffusing attachments and their location shall be done to achieve uniform air distribution. The grilles and diffusers shall be painted M.S or aluminum as specified and shown on the drawing.
- 04.00.03 The ducting shall be supported by means of hangers from the ceiling slab using anchor bolts and shall not rest on the false ceiling.
- 04.00.04 Duct crossing walls and slabs shall be encased in wooden frame work and the openings shall be closed properly unless indicated on the drawing for the purpose of return air.

- 04.00.05 Volume control dampers of splitter or louvred type shall be provided as shown on the drawings. Additional dampers if required shall be provided for proper balancing of the air distribution system.
- 04.00.06 Fire dampers shall be provided at the AHU outlet and return air inlet to the Air Handling Equipment/room Additional fire dampers shall be provided as per the codes of local fire authorities.
- 04.00.07 Access door shall be provided adjacent to the fire, splitter and louvred dampers.
- 04.00.08 Air outlets shall be selected based on the air quantity, throw and aerodynamic noise power not exceeding NC 30. The location size and shape of the air outlets shall be co-ordinate with interior and false ceiling scheme.

05.00.00 DUCT FABRICATION

06.00.01 Duct shall be rectangular or circular as indicated on the drawings. The Duct shall be made of either galvanized steel sheet as specified in the BOQ and conform to IS:655. The galvanized steel sheet shall conform to IS:277. Aluminum sheet shall confirm to IS:737. The duct construction shall be as follow:

(A) Rectangular Duct Construction:

MAX.SIDE Mm	THICK.GSS sheet	TYPE OF JOINT BRACKING	BRACKIN (S.W.G)
Up to 750	24G	25mm GSS Flanges	
751 To 1500	22G	25mmX3mm Ms angle flange	25mmX3mm Ms Angle
1501 To 2250	20G	40mmX3mm ms angle flange	40mmX3mm ms angle at 1.24 center
2251 & above	18G	50mmX3mm ms angle flange	50mmX3mm ms angle at 1.24 center

(B) Hanger for Duct:

Duct Size Mm	Spacing Not exceeding m	Size of ms angle mmXmm	Size of Rod Dia mm
Up to 750	2.5	25X25X3	6
751 to 1500	2.5	40X40X3	6

- 05.00.04 The companion flanges and girth angles shall be metered and Welded at corners and riveted to the duct at 75mm centers. The longitudinal seams shall be inside groove or pits burg type. The Flanged joints shall be made air tight with 3mm rubber or 6mm felt gasket and secured with 10mm GI bolts at 150mm centers. Ducts shall not be cross-broken, if insulated. The seams and joints shall be rendered air tight with mastic sealant.
- 05.00.05 The elbows shall have a minimum R/D ratio of 1:3. The elbows of R/D rate of less than 1:3 and square elbows wherever provided due to Site condition, shall be with equally spaced guide vanes for smooth flow. Splitter dampers shall be provided for all branch splits. All branches, feeding More than two outlets shall be provided with control dampers.
- 05.00.06 Capped airflow connections shall be provided, wherever shown, for testing and balancing of air distribution.

06.00.0 DAMPERS & GUIDE VANES

06.00.01 The GUIDE VANES shall be provided as shown below:

- a) At every non-split branch take off
- b) At every bend/elbow of less than 1.3 R/D ratio
- c) At first 4 collars after the fans and first two collar after every bends.

The vanes shall be double walled and properly curved for smooth air flow and change indirection of flow and shall be fabricated out of 0.8 mm GI sheets. The vanes shall be fixed to the side runners at equidistant and riveted/bolted to the ducts.

06.00.02 The SPLITTER DAMPERS shall be double walled aerofoil blade fabricated out 1.6mm (16 SWG) GI sheet. The damper shall be complete with flanged sheet metal enclosure to suit the upstream and down stream duct connections, hinge at the down stream and operating rod at the upstream end. The GI enclosure shall be one size thicker than the up stream duct.

06.00.03 The LOUVRED DAMPERS shall be multi blade aerofoil construction with opposed/parallel blades of maximum 250 x 1200 mm size. The blades shall be mounted on 50mm channel with suitable gang operated linkage and operating rod. The operation rod shall be terminated in a locking quadrant with position indicator.

06.00.04 The FIRE DAMPERS shall be rated for 2 hrs. fire resistance conforming to BS : 476-1 and CP-413 and shall be housed in a GI sheet enclosure flanged at both ends and shall include the damper blades, fusible link, holding spring, manual adjustable handle etc.

The material for fabrication of fire dampers shall be as shown below:

- a) Damper blades - 3mm (10 SWG) Galvanized sheet steel
- b) Casing - 2mm (14 SWG)
- c) Bearing – Sintered
- c) Spring - SS 304
- d) Fusible link - Set for 7 deg C fusing temperature

06.00.05 All dampers larger than 1200 mm width shall be fabricated in multiple sections. The damper rods shall be MS epoxy coated with bronze bushes at one end and locking quadrant with damper position indicator at the other end. The damper rods shall extend beyond the enclosure frame and insulation wherein provided.

06.00.06 The access doors for dampers shall be 400 x 400mm steel bolted with rubber gasket.

07.00.00 AIR OUTLETS

07.00.01 The air outlets shall be grille or diffuser type as indicated on the drawing. The grilles and diffusers shall be MS painted, aluminum or aluminum powder coated as shown on the drawing and schedule of material.

07.00.02 Supply air grilles shall be double deflection type with horizontal face bars and vertical rear bars placed in a rigid marginal frame. Bars shall be shaped and spaced at 18mm centers with swaged pivot pins positively holding the defections setting under all conditions of velocity and pressure. All grilles shall be provided with integral opposed blade, grille face kept-operated dampers.

07.00.03 Return grilles shall have fixed face bars shaped and set at 18mm centers. Bars shall be set at 5degree deflection for vision proof installation. The grilles shall be complete with rigid marginal frames and shall be matching with the supply grilles.

07.00.03.1 Ceiling diffusers shall be round/square/rectangular face flush type horizontal air Diffusion pattern. Diffusers shall have ample margins to minimize ceiling smudge.

Half diffusers shall be provided with face operated volume control dampers. Half diffusers shall be similar to full diffusers.

07.00.04 All MS grilles and diffusers shall be fabricated out of 1.0mm mild steel and painted with two coats of red oxide. All duct collars terminating on to a grille or diffuser shall be given two coats of black paint for a length of 300mm.

07.00.06 Aluminum grilles and diffusers wherever specified shall be of extruded aluminum with margins & GSS butterfly dampers. Grilles shall have horizontal face bars only.

07.00.05 Linear diffusers/grilles shall be die formed, flush mounted type with single or double directional airflow. The diffuser/grille shall be in a frame with minimum 20mm margin. All linear air diffusing equipment shall be fitted with a distribution sheet metal plenum as shown on the drawings.

08.00.00 AIR INTAKES & EXHAUST OUTLETS

08.00.01 The outside air intakes and exhaust air outlets shall consists of louvers, bird screen and enclosure, the total assembly fitted into wall with clear opening and the edges sealed with mastic sealant.

08.00.02 The sheet metal enclosure shall be made out of 1.25mm GI sheets flanged at both ends and with minimum 4 hold fast. The enclosure shall be minimum 250mm long or 100mm more than the width of the wall.

08.00.03 The louvers shall be 100mm wide mounted at 45 deg. and spaced at 100mm centers and shall be fabricated out of 1.25mm GI sheets.

08.00.04 The bird screen shall be made out of 15 x 15mm 1.0 mm GI wire mesh inset with 0.8mm GI frame and bolted to the enclosure flange at 150mm centers using 12mm MS brass bolts and nuts.

09.00.00 INSTALLATION

09.00.01 The ducts shall be supported at the traverse joints as indicated below :

- a) Up to 1800 mm 40 x 40 x 3mm M.S angle with 10mm tie rod
- b) 1850 to 2500 mm 40 x 40 x 6mm M.S angle with 10mm tie rod
- c) 2550mm and above 50 x 50 x 6mm M.S angle with 10mm tie rod

09.00.02 Additional supports wherever considered necessary by the Engineer - in-charge shall be provided. Supports shall be taken from steel members grouted in the RCC work and fixing of steel members shall involve minimum damage. The entire supporting system shall be meet with the approval of the Engineer-in-charge.

09.00.03 All duct supports, flanges; hanger shall be given two coats of red-oxide before installation and one coat of aluminum paint after erection.

09.00.04 Where ducts are connected to the wall, such connections shall be made through mild steel frame fixed to the wall through suitable shear fasteners.

10.00.00 INSTALLATION

10.00.01 The ducts shall be routed as shown on the drawing or as instructed. Working drawing shall be got approved before taking up the fabrication and erection..

10.00.02 Ducts connecting to air moving apparatus shall be through 15 OZ mildew resistant double canvases directed by the Engineer. On all circular spigots the flexible material is to be screwed or clip band with adjustable screw or toggle fitting. For rectangular ducts the material is to be flanged and bolted with a backing flat or bolted to mating flange with backing flat. The flexible connection shall not be less than 75mm and not more than 200mm.

PART-A	10	SIGNATURE OF CONTRACTOR
---------------	-----------	--------------------------------

11.00.00 TESTING & BALANCING

- 11.00.01 The entire air distribution shall be adjusted and balanced for delivery of design air quantities or as required for achieving design space conditions. After all adjustments are made, the air readings shall be recorded on the drawings vis-à-vis the space conditions. All dampers after adjustment shall be set and locked in position. All air and static pressure measurements shall be done through problem type meters. Vane type meter readings are not considered reliable.

2103 THERMAL INSULATION

01.00.0 SCOPE

- 01.00.01 The scope under this section covers thermal insulation of pipes, ducting, roof and walls.

02.00.0 STANDARDS

- 02.00.01 The following standards shall be applicable:
- a) IS : 7240 COP for application and finishing of thermal insulation material at temp. between 80degree C to 40 degree C.
 - b) IS: 7413 COP for application and finishing of thermal insulation material at temp. between 40degree C to 700 degree C.
 - c) IS: 10556 COP for storage and handling of insulation material
 - d) IS: 3346 Method of determination of thermal conductivity of thermal insulation material
 - e) IS: 3690 Specification for glass wool mats for thermal insulation
 - f) IS: 4671 Specification for expanded polystyrene for thermal insulation purposes
 - e) IS: 8183 Specification for bonded mineral wool
 - f) IS: 702 Specification for industrial bitumen

03.00.0 GENERAL REQUIREMENTS

- 03.00.01 The material and thickness for insulation shall be as specified and shown on the bill of material.

The thermal conductivity and the equivalent thickness of insulation shall be as shown below:

SL.NO.	MATERIAL	DENSITY Kg/cum	K VALUE w/mk	EQUIVALENT THICKNESS			
				mm	mm	mm	mm
1.	Resin bonded glass wool	32	0.037	125	100	50	30
2.	Expanded polystyrene TF-quality	18	0.0326	100	75	50	25
3.	Expanded polyurethane	32	0.025	80	40	40	20
4.	Rigid phenol foam	32	0.022	70	50	25	20

PART-A	11	SIGNATURE OF CONTRACTOR
---------------	-----------	--------------------------------

5.	Resin bonded mineral wool	48	0.041	125	100	60	30
6.	Expanded polyethylene foam	30	0.035	100	75	80	30

- 03.00.02 The insulation, bonding and the vapor barrier shall be suitable for the temperature of the surface to be insulated and the location.
- 03.00.03 All wooden bittens and plugs used shall be teak wood ant termite treated with 3 coats of Shalimar clear liquid. All screws shall be of GI, brass or powder coated.
- 03.00.04 All surfaces to be insulated shall be thoroughly cleaned and dusted before applying the insulation and bonding material. The bonding material shall be applied to both surfaces to be bonded.
- 03.00.05 The pipe insulation shall be carried out using preformed circular/semi circular pipe sections of internal diameter matching the external diameter of the pipe.
- 03.00.05 Air pocket between the surface and insulation or between insulations shall not be acceptable. All joints shall be staggered and filled with bonding material.
- 03.00.06 Minimum 50mm overlapping shall be provided for joints in vapor barrier and cladding.

04.00.00 MATERIAL

- 04.00.01 The material for cold insulation shall be as shown below:
- Fire inhibiting expanded polystyrene of density 18 kg/cum having thermal Conductivity not exceeding 0.035 w/mk at 10 deg. C mean temperature conforming to IS : 4671.
 - Expanded polyurethane foam of density 32 kg/cum having thermal conductivity not exceeding 0.025 w/mk at 10 deg. C mean temperature conforming to Specification.
 - Rigid phenol foam of density 32 kg/cum having thermal conductivity not 0.022 w/mk at 10 deg. C mean temperature conforming to BS: 3927 with 50 micron aluminum foil fixing.
 - Expanded polyethylene foam of density 30 kg/cum having thermal conductivity not exceeding 0.035 w/mk at 10C mean temperature.
- 04.00.02 The material for hot insulation shall be as shown below:
- Resin bonded glass wool of density 32 kg/cum having thermal conductivity not exceeding 0.037 w/mk 60 deg C mean temperature
 - Expanded polyurethane foam of density 32 kg/cum having thermal conductivity not exceeding 0.025 w/mk at 10 deg. C mean temperature conforming to BS specification.

- c) Rigid phenol foam of density 32 kg/cum having thermal conductivity not exceeding 0.022 w/mk at 10 deg. C mean temperature conforming to BS: 3927 with 50 micron aluminum foil fixing.
- d) Resin bonded mineral wool of density 48 kg/cum having thermal Conductivity not exceeding 0.041 at 10 deg C mean temperature conforming to IS : 8183 with 50mm.

04.00.03 The material for fixing vapour barrier and other material shall be as shown below :

- a) BONDING MATERIAL
 - i) Industrial bitumen-85/40 and 85/25 conforming to IS:702.
 - ii) GI chicken wire mesh - 20 mm 24 SWG
 - iii) PRX compound
 - iv) 18 SWG GI binding wire
- b) VAPOUR BARRIER
 - i) Aluminum foil 50 micron.
 - ii) Aluminum cladding 28 SWG for pipe and 6 SWG for wall
 - iii) 2mm PYPKOTE with aluminum foil finish for surface exposed to the weather.
 - vii) 4mm PYPKOTE polymeric corrosion tape for anticorrosion treatment for underground.
- c) FIXING MATERIAL
 - i) Bituminous wood balk 50 x 50mm thick insulation and 50 x 100 up to 150mm thick insulation
 - ii) GI brass or powder coated.

05.00.00 INSULATION THICKNESS

05.00.01 The thickness of insulation and the cladding material for various utilities shall be as specified under each section.

05.02.01.1 REFRIGERANT PIPING

05.02.01 The refrigerant piping shall be of half – hard copper RS 250 conforming to EN .1057 Table Y. The fittings shall be of shot end capillary brazing conforming to EN 1254. The pipes shall be supplied on coils and cut to required length to achieve full length without joints between the condenser and evaporator.

05.02.02 The fittings for connection to the condenser evaporator expansion valve etc shall be through copper – brass composite fitting. The brazing / soldering material shall conform to EN. 29453.

05.02.03 The refrigerant lines shall be insulated with 9mm Nitride rubber tubing to prevent heat loss and condensation .

Refrigerant piping running along the partition wall shall be concealed in the wall with necessary chasing in the wall and closing the same with sand cement plastic with chicken wire mesh.

05.03.00 DRAIN PIPING

- 05.03.01 The evaporator shall be piped to the nearest drain point / drain line using UPVC pipe conforming to 4985 . Necessary water seal trap shall be provided at the evaporator at the discharge point.
- 05.03.02 condensate from the evaporator unit shall be drained through properly installed drain piping designed to prevent any accumulation of condensate in the drain pan.
- 05.03.03 Drain piping shall be made of 1.1/4" & 1/2" rigid pvc pipe of kg/cm² pressure rating with water tight threaded connection , leading from the room unit to a suitable drain point. Complete drain piping shall be made leak proof and water tight by means of precises installation and the use of leak proof sealant / adhesives. Insulation of drain piping by expanded polyethylene.

07.00.00 INSULATION OF DUCTING**07.00.01 THERMAL**

Supply or Return air duct shall be insulated with 75 / 50 / 25 mm thick Fibre Glass of density 24 kg./ Cu.M. The Fibre Glass shall be of factory packed Aluminum foil.

Method of applying the insulation:-

Clean the duct surface to be insulated.

Apply a thin layer of Tar paint of Shali coat / Ticky tar.

Apply a thin coat of hot bitumen to stick the insulation.

Fix the insulation of specified thickness over the surface of the duct tightly and seal the joints with using BOPP tape.

Secure the insulation with 16 Gauge G.I. wire or 10mm PVC box strapping at a distance of 300 mm.

07.00.02 ACOUSTIC INSULATION

First 3-meter length of supply air duct shall be acoustically insulated with 12.5 mm thick fibreglass of density 48 kg/ Cu. M. and covered with 28 G perforated aluminum sheets from inside of the duct.

Method of applying the insulation: -

Apply a thin layer of Tar paint of Shali coat / Ticky tar.

Fix-up fiberglass slab.

Cover-up with perforated aluminum sheets with the help of G.I. screw washer.

08.00.00 CEILING/WALL INSULATION

- 08.00.01 The ceiling/wall insulation shall be as shown below :

SL.NO.	SURFACE	LAYER X THICKNESS	MATERIAL	CLADING
1.	Exposed concrete roof	1 x 50	Expanded Polystyrene	Plaster
2.	Over exposed concrete roof	1 x 30	Polyurethane Foam	By others

PART-A	14	SIGNATURE OF CONTRACTOR
---------------	----	--------------------------------

3.	Exposed GI or ACC roof	1 x 75	Expanded Polystyrene	A/c sheet
4.	Exposed wall	1 x 50	Expanded Polystyrene	Plaster by others
5.	False ceiling	1 x 50	Resin bonded glass wool	Fibre glass tissue

14.00.00 RCC ROOF

- 14.00.01 The thickness of insulation required is 50mm expanded polystyrene unless otherwise specified.
- 14.00.02 Make wooden frame work at 600 to 750 mm centers on ceiling slab by fixing 50 x 50 wooden battens using 75mm long wooden screws and self expanding nylon tumblers. Clean the surface of slab and apply 3mm high softening grade R 85/25 bitumen. Apply one coat of bitumen on the bonding surface of the insulation and press against the slab till the bonding is achieved.
- 14.00.03 Fix 18 SWG 100 x 100 mm GI washers at the junction of the wooden framework and made GI melting in cross binding pattern to hold the insulation.
- 14.00.04 The insulation provided above false ceiling and non visible areas need not have cladding unless otherwise specified. The insulation provided in the visible areas shall be plastered by other agencies after providing chicken wire mesh.

15.00.01 WALLS

- 15.00.0.01 The thermal insulation for the walls shall be similar to RCC slab. The thermal insulation shall be provided on West, North West and East side exposed walls, if specified.

16.00.00 GI OR ACC ROOFING

- 16.00.01 The thickness of insulation required is 120mm resin bonded glass wool unless otherwise specified.
- 16.00.02 Weld 25 x 3 x 130mm M.S flats with 6mm hole at the free end to the purlins at intervals not exceeding 750mm. Apply 3mm bitumen to the roofing material and one coat to the insulation. Press the insulation against the roof till the bonding is achieved.
- 16.00.03 Make GI melting in cross bind pattern to hold the insulation. Clad the insulation with FRP tissue sheet or aluminum foil applying bitumen on the insulation as well as the cladding material.
- 16.00.04 Care shall be taken the close all openings especially for corrugated sheets to ensure stoppage of hot air through the opening/corrugation space place ACC sheet, if required, shall be provided below the insulation to avoid entry of heat and to hold the insulation in position. The ACC sheets shall be considered as separate item unless otherwise indicated in the bill of material.

2104 MAKES OF MATERIAL

01.00.00 SCOPE

01.00.01 The scope of this section covers the recommended makes of equipments, material components. The final choice of makes shall be indicated at the time of finalization of the order.

01.00.02 The makes of material offered by the contractor shall be indicated at the space provided for proper evaluation of the offer and shall be one of the recommended makes. In the absence of such indication, the decision rests with the Consultants/Clients.

01.00.02 For items, make are not recommended contractor shall obtain approval from Consultant prior to procurement.

02.00.00 MAKES RECOMMENDED

02.00.01 The makes of material recommended are as shown below. The offers shall be strictly on the basis of the makes underlined. However, the bidders can offer alternative makes under section deviation. Such deviation shall follow with technical literature of the material/equipment offered.

SL.NO.	ITEMS	MAKES RECOMMENDED	MAKES OFFERED
1.0	Airconditioning Units		

LIST OF APPROVED MAKES FOR HVAC EQUIPMENT AND MATERIALS

Sl.No.	Details of the Items	Manufacturer's name
1.	Package / Ductable units	Hitachi, Carrier , Daikin , Voltas, Blue star
2.	Propeller Fans	Crompton
3.	Electric Motors	Crompton / Siemens/Bharat Bijlee
4.	Ventilation AHU	Suvidha / Caryaair / Citizen/Cherub
5.	GI Sheet	Sail/TATA/ Jindal
6.	Grilles/Diffuser	Caryaair/Ravistar//Dynamic
7.	MS Dampers/Louvers	Tristar/ /Cherub
8.	Control Cables	Grandlay/Batra Henlay/Kalinga
9.	Power Cable	ICC/Polycab
10.	Nitrile rubber Insulation for ref pipe insulation	Eurabatax/Aeroflex/Totaline
11.	Flexible Duct Connection	Airflow/Pyroguard
12.	Gaskets	Neoprene rubber
13.	Adhesives	Fevicol / Superlon
14.	Vibration Isolator	Resistoflex/Dunlop
15.	Filters/Air Showers	Dyna/Thermadyne/Cherub
16.	Polyethylene for duct insulation	Supreme/Trocellene/Totaline
17.	Centrifugal / Axial fan	Flaxt/ PAF/ Chakshu
18.	Refrigerant Pipes	Rajco/Parasmani
19.	Cassette Units	Daikin//General/Hitachi/Voltas/ Carrier

2105 REFERENCE DRAWING

01.00.00 SCOPE

01.00.01 The Scope under this section covers the basic drawings and details to understand.

- a) Scope of work
- b) Location of equipments
- c) General idea on the entire installation
- d) Material requirements and labour force required for the completion of work in the stipulated time schedule.

01.00.02 The reference drawings are basically schematic/diagrammatic to give idea on general requirements prepared on the basis of preliminary requirements and data available. They are subject to undergo changes and modifications subject to the finalization of details and requirements of the clients.

01.00.03 The detailed working drawings and the drawings required for the submission to statutory authorities shall be the responsibility of the contractor. Contractor shall submit minimum four copies of the drawings to the Consultants for their scrutiny/approval before issuing to the statutory authorities and site for execution.

NOTE : This specification is of the general type only and must be used in conjunction with the drawing of the particular item being made. Anything shown on the drawing and not in the specification must be complied With , and vice versa.

Technical information to be furnished by the tender along with the tender (please fill separate for each model/tonnage

A Compressor

A	Type			
B	Make/model			
C	Quantity			
D	Kw (motor connected)			
E	Kw (motor- consumed)			
f	Full load current			
g	Refrigeration capacity(at 5 deg.c suction 50 deg.c discharge)			
h	Refrigerant			

B Condenser

a	Type			
b	Air quantity –cfm			
c	Coil face area (sqft)			
d	No of rows			
e	By pass factor			
f	Full load current of fan motor			
g	fan motor kw/rpm			
h	St. pressure of fan			
i	No. of speed for fan			
j	Copper tube thk/dia			
k	Al. fin spacing/gauge			

C Evaporator

A	Type			
B	Air quantity			
C	Coil face area			
D	No. of rows			
E	By pass factor			
F	Fan motor kw/rpm			
G	Full load current of fan motor			
H	St. pressure of fan			
I	No. speed for fan			
J	Copper tube thk/diameter			
k	Al. fin spacing/gauge			

D Overall Dimensional Details

A	Condensing unit			
B	Evaporating unit			

E Salient Features

A	Type of filter			
B	Filter area			
C	Filtration level			
d	Any other detail			

F Total power Consumption of the unit

		compressor	Condenser fan	Evap. fan	total
A	16.5 Tr				
B	Tolerances				
	Voltage				
	Power factor				
	Frequency				

G Pipes & fitting

Refrigerant

drain

- a) Manufacture
- b) Class
- c) Material
- d) Thickness / Diameter

H Insulation materialExpanded
PolystyreneExpanded
polyethylene

- a) Manufacture
- b) Material
- c) 'K' value at 10 deg.C mean temperature

I Insulation material: **Fiber glass**

- a) Manufacture
- b) Material
- c) 'K' value at 10 deg.C
mean temperature

J Cables

- a) make
- b) type
- c) grade

K Centrifugal fans

- a) Manufacture
- b) Diameter
- c) Speed rpm & hp
- d) CFM/Static pressure
- e) Static/Dynamic balancing
- f) Overall dimensions
- g) Types of fan/model
- h) Operating weight
- i) Noise level
- j) Efficiency

L Electric motor

- a) Manufacture
- b) Model no
- c) Rated output H.P
- d) Range of working voltage
- e) Rated speed rpm
- f) Starting current (amps)
- g) Full I load current
- h) Class of insulation
- i) Tempt. Rise after 8 hr on full load
- j) Efficiency & power factor at 100% load
- k) Type of stator