

Standard Specification  
for  
Air Conditioning and Ventilation System

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## 1. GENERAL

- 1.1 This specification covers supply, installation, testing and commissioning and handing over to Employer of Air conditioning system for the control room building, switch-yard panel rooms and GIS Hall.
- 1.2 Air conditioning units for control room building shall be set to maintain the inside dry bulb temperature (DBT) at  $24^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and the air conditioning system for switch-yard panel rooms shall be set to maintain DBT inside switch-yard panel rooms below  $24^{\circ}\text{C}$ .
- 1.3 At least 50% spare Air-Conditioning capacity shall be provided for Local Control rooms in the GIS halls.
- 1.4 Controllers shall be provided in Control room, Battery room and local control room inside GIS hall for controlling and monitoring the AC units in these rooms as detailed in [clause no. 2.3.iii.e](#).
- 1.5 Each switch-yard panel room and local control room inside GIS hall shall be provided with temperature transducer to monitor the temperature of the panel room. The Temperature transducer shall have the following specification:

Sensor	Air temperature sensor (indoor use)
Output	4 to 20mA
Temperature range	$-5^{\circ}\text{C}$ to $60^{\circ}\text{C}$
Resolution	$0.1^{\circ}\text{C}$
Accuracy	$0.5^{\circ}\text{C}$ or better

## 2. AIR CONDITIONING SYSTEM FOR CONTROL ROOM BUILDING.

- 2.1 Air conditioning requirements of control room building shall be met using a combination of following types of Air Conditioning units as required.
  - a. Ductable Split unit of 8.5TR.
  - b. Cassette type split AC units of 3TR.
  - c. High wall type split AC units of 2TR.

### 2.2 Scope:

The scope of the equipment to be furnished and services to be provided under the contract are outlined hereinafter and the same is to be read in conjunction with the provision contained in other sections/ clauses. The scope of the work under the contract shall be deemed to include all such items, which although are not specifically mentioned in the bid documents and/or in Bidder's proposal but are required to make the equipment/system complete for its safe, efficient, reliable, and trouble-free operation.

- i. Required number of Ductable split type AC units of 8.5 TR capacity with air cooled outdoor condensing unit with semi hermetic/hermetic compressors including refrigerant pipes, controls, thermostats, filters, outlet dampers, etc.
- ii. Required number of Cassette type split AC units of 3TR capacity each complete with air cooled outdoor condensing unit having hermetically sealed compressor unit with

cordless remote controller.

- iii. Required number of High wall type split AC units of 2TR capacity each complete with air cooled outdoor condensing unit having hermetically sealed compressor and high wall type indoor evaporator unit with cordless remote controller.
- iv. Copper refrigerant piping complete with insulation between the indoor and outdoor units as required.
- v. First charge of refrigerant and oil shall be supplied with the unit.
- vi. GSS/Aluminium sheet air distribution ducting for distributing conditioned dehumidified air along with supply air diffusers and return air grilles with volume control dampers and necessary splitters etc., suitable fixtures for grilles/diffusers and supports for ducting complete with insulation.
- vii. Local start/stop facility for local starting/ stopping of all electrical equipment/ drives.
- viii. All instruments and local control panels along with controls and interlock arrangements and accessories as required for safe and trouble-free operation of the units.
- ix. PVC drain piping from the indoor units up to the nearest drain point.
- x. Supply and erection of Power and control cable and earthing.
- xi. MS Brackets for outdoor condensing units, condensers as required.

## 2.3 Technical specifications:

### i. Ductable split type AC units.

- a. Each Split Air conditioner shall have an indoor unit and an outdoor unit, designed to provide free delivery of conditioned air to the conditioned space. The indoor unit shall be suitable for mounting on the ceiling concealed above the false ceiling. Outdoor unit can be placed on the roof. Each unit shall include a primary source of refrigeration for cooling and dehumidification, means for circulation and cleaning air.
- b. Cabinet  
The cabinets housing the components of indoor units & outdoor units shall be of heavy gauge sheet steel and suitable for floor mounting/mounting from ceiling. The access panels shall be of easily removable type. The entire casing shall be lined with 25mm thick insulation of totally flame proof type. Suitable drain connection shall be provided for removal of condensate collected inside a tray under cooling coil.
- c. Compressor  
The compressor shall be Semi hermetically/hermetically sealed type and complete with drive motor. The compressor shall be mounted on spring inside the lower most section of the unit so that it is easily accessible for servicing.
- d. Condenser  
Air cooled condenser of adequate surface area shall be offered. The air-cooled condenser shall be made of copper tubes with external fins.

e. Air Handling Fan

The air handling fan shall be centrifugal type complete with belt drive and electric motor.

f. Filter

Pre-filter at the suction to remove dust particles down to 10-micron size with 90% efficiency and fine filters to remove dust particles down to 5-micron size with 99% efficiency at the outlet. All filters shall be of panel type.

g. Cooling Coil

Cooling coils shall be of direct expansion type and made of heavy gauge copper with aluminium fins. Rows shall be staggered in the direction of air flow. Separate tubing from the distributor shall feed refrigerant uniformly to different sections of the coil.

h. Refrigerant Piping

Refrigerant piping shall be of heavy gauge copper to IS:2501 or IS:1239 heavy class seamless M.S. pipe complete with thermostatic expansion valve, liquid strainer, dehydrator, liquid line shut off valve, high- and low-pressure gauges.

i. Condensate Trays

An adequate method of condensate removal shall be provided. Condensate tray of adequate size, made of corrosion-resistant material or suitably treated with corrosion-resistant coating shall be provided. The tray should be adequately insulated to avoid condensation over its external surface.

j. Refrigerant Strainer

A refrigerant strainer shall be provided in the liquid line immediately before the expansion device.

k. Vibration Isolator

A minimum of six nos. 25mm thick neoprene rubber pads shall be supplied for each unit.

**l. Cooling capacity of 8.5TR unit shall not be less than 102000 btu/hr.**

**ii. Cassette type split AC units.**

The Cassette type AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote-control units.

a. Outdoor unit shall comprise of hermetically/ semi hermetically sealed compressors mounted on vibration isolators, fans and copper tube aluminium finned coils all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.

b. Indoor units shall be of 4-way, ceiling mounted cassette type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi-function cordless remote-control unit with special features like

programmable timer, sleep mode etc.

- c. The cooling capacity of 3TR AC units shall not be less than 36000btu/hr. and shall have energy efficiency rating of 4 star or above.**

**iii. High wall type split AC units**

- a. The split AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote-control units.
- b. The outdoor unit shall comprise of hermetically/semi hermetically sealed compressors mounted on vibration isolators, propeller type axial flow fans and copper tube aluminium finned coils, all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.
- c. The indoor units shall be high wall type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi-function cordless remote-control unit with special features like programmable timer, sleep mode and soft dry mode etc.
- d. The cooling capacity of 2TR AC units shall not be less than 22000btu/hr. and shall have energy efficiency rating of 4 star or above.**
- e. Controllers shall be provided in the Control room, Battery room and Local control room inside GIS Hall, one controller for each room, to control and monitoring of AC units and shall have the following facilities.
- Standby units shall come into operation automatically when the running main unit fails.
  - Main and standby units shall be changed periodically, which shall be finalized during detailed engineering.
  - Following alarms shall be provided:
    - Compressor On/OFF condition of each unit
    - Compressor failure of each unit
    - Power OFF to AC unit
    - High temperature in room.

2.4 The Split AC units shall be of Carrier, Voltas, Blue Star, Hitachi, Daikin, LG, National, O'General or Samsung make.

2.5 Warranty

All compressors shall have minimum 5 years warranty from the date of commissioning.

**3. AIR CONDITIONING SYSTEM FOR SWITCHYARD PANEL ROOMS.**

- 3.1 Air conditioning systems shall be provided in the switchyard panel rooms used for housing control and protection panels. These panel rooms will be located in the switchyard area and generally unmanned. Therefore, the air-conditioning system shall be rugged, reliable, maintenance free and designed for long life.

3.2 Air conditioning systems are required for maintaining the temperature below 24°C for control and protection panels. This shall be achieved using Packaged AC units with free cooling arrangement as per the clause below. The system shall be designed for 24 Hours, 365 Days of the year operation to maintain the inside Switchyard panel rooms temperature for proper operation of the critical equipment.

3.3 Number and rating of the units for each panel room shall be as follows:

For panel room of length upto 6 meters	2 nos. AC units of 2TR capacity each (1 working + 1 standby)
For panel room of length more than 6 meters	2 nos. AC units of 3TR capacity each (1 working + 1 standby)

3.4 Technical specification for Packaged AC units with Free Cooling.

- i. Each AC unit shall be complete with air cooled condensing unit with scroll compressor, direct expansion type evaporating unit and microprocessor controller. **AC units shall be provided with free cooling arrangement.** In free cooling mode, the refrigerant cycle of AC unit shall be switched off and outside air (after filtration) shall be circulated inside the conditioned space through the operation of dampers provided with suitable sensors. This mode shall come into operation in the following conditions.
  - a. When the ambient temperature is below a preset value, which is to be decided during detailed engineering.
  - b. In case of failure of refrigeration system of both the units.
- ii. One of the air-conditioners shall be running at a time and shall maintain the required temperature. On failure of the running air- conditioner, the other air-conditioner shall start automatically. To ensure longer life of the system and to keep the AC units healthy, changeover of the standby unit shall be done periodically through the controller. Further, if inside temperature of the room reaches 35°C due to any emergency condition, the standby air-conditioner shall also start running to maintain the temperature less than 24°C and system shall generate an alarm for such a situation. After achieving this temperature, the standby unit shall again shut off. However, any hunting situation shall be reported. No heating or humidification is envisaged for the air conditioning system inside the Switchyard panel rooms.
- iii. Packaged AC units with free cooling shall be designed for highly sensitive cooling with sensible heat factor of 90% or above.
- iv. Each air conditioner shall be completely self-contained. All components of the units shall be enclosed in a powder coated cabinet. The unit shall be assembled, wired, piped, charged with refrigerant and fully factory tested as a system to ensure trouble free installation and start up. Suitable isolation or other by-passing arrangement shall be provided such that any unit/component could be maintained/ repaired without affecting the running standby unit.
- v. The AC units shall be mounted on the wall and the maintenance of unit shall be possible from outside the Switchyard panel room.
- vi. Required Features of Various Components

The compressor shall be very reliable, trouble free and has long life i.e. hermetically

sealed Scroll type of reputed make suitable for continuous operation. Compressors should be installed on vibration isolated mountings or manufacturer's recommended approved mountings. Valve shall be provided for charging/topping up of refrigerant. **The bidder shall furnish details of their compressor indicating the MTBF, life of compressor and continuous run time of compressor without failure.** The contractor shall also furnish details of all accessories i.e. refrigeration system, evaporator coil, condenser coil, evaporator blower, filter, cabinet, indoor supply and return grill etc. during detailed engineering.

### 3.5 Warranty

All compressors shall have minimum 5 years Warranty from the date of commissioning.

### 3.6 For Employer's remote monitoring purposes, necessary digital inputs shall be provided for 'ON' and 'OFF' condition of each compressor.

## 4. AIR CONDITIONING & VENTILATION SYSTEM FOR GIS BUILDING

### 4.1 Air conditioning requirements of the building shall be met using a combination of following types of Air Conditioning units as required.

- a. Cassette type split AC units of 3TR.
- b. High wall type split AC units of 2TR.

Type & Capacity of air conditioners shall be chosen such that quantity of air conditioners in the room is optimized keeping the necessary air flow.

### 4.2 The Scope and Technical specification shall be governed by the above clauses i.e. clause no. 2.2 and 2.3.

### 4.3 Ventilation system for GIS Hall (As applicable)

Each GIS Hall shall have an independent ventilation system. Each Ventilation system shall consist of two 100% capacity systems, one operating and one stand-by. To ensure that the air being supplied to the GIS hall is free from dust particles, a minimum of two stage dust filtration processes shall be supplied. This shall consist of at least the following:

- i. Pre Filters: To remove dust particles down to 10 microns in size with at least 95% efficiency.
- ii. Fine Filters: To remove dust particles down to 5 microns in size with at least 99% efficiency.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

**The ventilation of the GIS hall shall be of a positive pressure type with minimum 2 air changes per hour. The pressure inside the GIS hall shall be maintained 5 mm of water above the atmospheric pressure.** Fresh outdoor air shall be filtered before being blown into the GIS hall by the air fans to avoid dust accumulation on components present in the GIS hall. GIS hall shall be provided with motorized exhaust dampers with local control.