

AC Specification & Installation Criteria for Hospitals, Ward Areas and other areas.

1 Installation Criteria

- Installation party should have at least Minimum experience of completing 2 Fresh Air Hospital Air condition Projects in Maldives over the past 5 years.
- Basic AC shop drawing should be provided with the following details
 - AC unit Location and sizes
 - Ducting Sizes and Locations
 - Grill Sizes and Locations
 - Pipeline Location and Sizes
- Upon Completion AC As build drawing should be provided

2 General AC Specification

- The brand of AC Equipment specified or to be proposed should have minimum 2 Fresh air or Hospital Air-condition Projects completed and delivered over the past 5 years in Maldives
- The Brand of AC Equipment specified or to be proposed should demonstrate that it is adequate to cater for highly corrosive environment of Maldives and should have 5 years of past projects completed
- The brand or AC Equipment specified should demonstrate all specs below from manufacturers original catalogue

3 Outdoor Specs

The Outdoor Unit Shall be Factory assembled with Weather Proof casing, constructed from Heavy Gauge Mild Steel Panels and coated with Anti Corrosive Epoxy resin finish. The unit should be completely factory wired and tested and shall be fitted with all necessary controls and switch gear.

- All outdoor units need to be VRV or Central systems which have the capacity to control & operate multiple indoor units
- The Condenser Coil of the Outdoor must be a black fin Condenser with anti-corrosion
- The brand of AC Equipment proposed should have an outdoor or outdoor sets with a maximum Energy Efficiency Ratio of (EER) kw/kw 4.5
- The brand of AC Equipment proposed should have Outdoor Environment sensor for Compressor Control and adjustment
- The Brand of AC Equipment proposed should have an outdoor or outdoor sets of Sound Pressure Level dB (A) below 60
- All Outdoor units shall be with inverter compressors and be able to operate even in the event of failure of one compressor

- All outdoor units need to have aluminium fins with $105 \pm 2 \mu\text{m}$ thickness, with special Anti-corrosive coating of $1.3 \pm 0.35 \mu\text{m}$ thickness and an outside Hydrophilic layer coating of $0.35 \pm 0.07 \mu\text{m}$ thickness.
- All outdoor units shall be equipped with high efficiency optimized heat exchangers with variable heat exchanger circuits
- The outdoor units shall be provided with its own microprocessor control panels
- The manufacturer needs to provide a warranty of 18 months replacement for the outdoor units

4 Indoor Specs

The indoor units shall be

4.1 In General:

- a. Ceiling Concealed Duct Systems for all General Wards, Operation Theatres & ICU's
- b. Ceiling Concealed Fresh Air Systems for all General Wards, Operation Theatres & ICU's
- c. Ceiling Cassette System for General Areas, Corridors, Consultation rooms

4.2 Ceiling Concealed Duct System & Fresh Air System

- The address of the indoor unit shall be set automatically in case of individual and group control
- In case of centralized control, it shall be set by liquid crystal remote controller
- The fan shall be a dual suction, aerodynamically designed turbo, multi blade centrifugal type fan which shall be statically & dynamically balanced to ensure low noise and vibration free operation. The fan shall be direct driven, mounted directly on motor shaft having support from the unit housing.
- The cooling coil shall be made out of seamless copper tubes and have continuous aluminum fins. The tubes shall be staggered in the direction of airflow and shall be hydraulically/mechanically expanded to bond to the fins. Each coil shall be factory tested at 21kg/sqm air pressure under water.
- Each unit shall have a cleanable type filter fixed to an integrally moulded plastic frame. The filter shall be a slide out type and shall be neatly inserted.
- All AC duct systems must have an H14 Hepa filters attached with 99.99% efficiency on Supply & Return Duct as well
- The capacity of Indoor unit have to be calculated as per the volume of the occupied space and should have Air exchange of the Minimum apart from operation theatres
 - 9 – 12 air changes per hour from the AC system
 - 2 -3 air changes per hour of Outside Air (Via Fresh Air System)
- For operation Theatres the Air Exchange Guideline should be
 - 25 air changes per hour from the AC system
 - 5 air changes per hour from Outside Air (Via Fresh Air System)
- Each indoor unit shall have computerized PID control for maintaining design room temperature. Each unit shall be provided with microprocessor thermostat for cooling .
- Each unit shall be provided with a hand held multi-function remote controller. The controller shall be able to change fan speed and angle of swing, temperature and mode.
- Each Unit shall have service Ball valves for After sale service and future Isolation of FCU

5 Ducting & Ventilation System

- All Conceal Duct Indoor System shall be connected to a Duct Ventilation system which shall be designed to provide the most appropriate air flow for designed Air-condition areas
- The Duct System shall be made with Pre-Insulated Panels with the below specs
 - Panel Thickness: 20 – 30mm
 - Foam Density: 45-48kg/m³
 - Aluminium thickness: 80/80m
 - Aluminium Type: Embossed
 - The Boards should be Anti-Bacterial, Anti Fungus & Fire Resistant
- All supply & Return Diffusers shall be
 - The Supply and return air diffusers/grills shall be made of extruded aluminum section with flush fixed pattern
 - White Powder Coated RAL9010 or 9016 standard
 - Supply Diffusers shall be with opposed Blade Volume dampers
 - Thickness of frame should not be less than 1.2mm. The core of the diffuser is 0.9mm thick pressed aluminum.
- All ducts shall be installed generally as per the drawings and in strict accordance with approved shop drawings to be prepared by the Contractor.
- The Contractor shall provide and neatly erect all PID Sheet work as may be required to carry out the intent, of these specifications and drawings. The work shall meet with the approval of Owner's site representative in all its parts and details.
- All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/ or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as per the site requirements.

6 Refrigerant Piping

All refrigerant piping for the air conditioning system shall be constructed from Hard seamless copper up to outer diameter of 41.3 mm and hard drawn copper above outer diameter of 41.3 mm. Fittings shall have silver-soldered joints and connections to equipment shall use compression fittings. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and shall to include charging connections, suction and liquid line insulation and all other items normally forming part of proper refrigerant circuits.

All joints in copper piping shall be swag 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 580 PSIG. 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 thickness of copper piping shall not be less than mentioned below as per Standard ASTM B280-03:

Pipe Size in mm(OD)	Minimum Wall Thickness in mm
a) 41.3	1.52
b) 38.1	1.52
c) 34.9	1.40
d) 31.8	1.40
e) 28.6	1.27
f) 25.4	1.27
g) 22.2	1.14
h) 19.1	1.07
i) 15.9	1.02
j) 12.7	0.81
k) 9.5	0.81
l) 6.4	0.76

The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturers specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, Cable tray, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

7 Refrigerant Pipe Insulation

The whole of the liquid and suction refrigerant lines including all fittings, valves etc. shall be insulated with 25mm thick insulation for all copper sizes. Insulation shall be closed cell elastomeric nitrile rubber.

a. Protection of exposed Refrigerant Pipe Insulation

To protect nitrile rubber of exposed piping from degrading due ultra violet rays & atmospheric conditions, it shall be covered polychelid coating with at least two coats of resin and hardener (Make-Polybond /Paramount Polytrear). Fiberglass tape shall be helically wound & painted with two coats of resin with hardener to give smooth & plain finish.