

# **Scope of work and Technical specifications for HVAC System**

## **AC INSTALLATION WORKS AT RESIDENTIAL AREA ROOM NO 304 ANGRE GUEST HOUSE, MDL, MUMBAI.**

### **SCOPE OF WORK**

A) Works under this shall comprise of Supply, installation, testing and commissioning of following at Room no 304 Angre Guest House Residential Area MDL.

- i) Inverter Cassette/Split Air conditioning units consisting of indoor units, outdoor units, cordless remote controllers with batteries, remote control holder, adequate length of power supply cables along with connecting pin & accessories.
- ii) M.S stands, grill work, structural work as per site requirements for installation of A.C outdoor units.
- iii) Copper refrigerant piping with insulation/nitrile rubber sleeves including clamping/supporting arrangement including making precise holes in the walls with core cutting m/c, providing sleeves and proper finishing for connectivity from indoor to outdoor units.
- iv) Suitable L-shaped brackets duly painted with bush and fasteners for mounting outdoor units wherever necessary as directed by MDL engineer.
- v) ISI mark UPVC plumbing grade condensate drain pipe & fittings with supports & clamps etc all complete for taking out condensate drain water from AC units up to the Ground Level.
- vi) 2.5 Sq mm 3 core/4 core Electrical cable for Inverter split AC (from indoor units to outdoor units) all complete.
- vii) Purging with suitable **eco-friendly** gas for flushing before leak test, leak testing of copper piping & first charge of pre-filled **eco- friendly** refrigerant gas considering lengths of copper piping & A.C unit's capacity etc all complete.
- viii) Scaffolding work required if any for the above work (**Under Contractor scope**)
- ix) The contractor shall arrange free of cost servicing to be carried out by Air Conditioner Manufacturers service engineer for the completed works including indoor unit, outdoor unit, copper tubing etc all complete at the interval of **every three months during Defect liability period.**

### **B) DRAWINGS AND DOCUMENTATION**

- i) The locations of the AC indoor units and outdoor units as shown in the tender drawings **are indicative and approximate.**
- ii) After award of contract, Contractor is required to submit the **print of installation/working drawings of A3 size in 04 sets** for the above scope of work and get it approved from MDL before starting up the work. Drawings (plan and elevation) should indicate the exact locations of AC indoor units, outdoor units, capacities of the ACs, copper tubing layout from

indoor to outdoor units and its size, condensate drain UPVC piping layout along with size and its looping/routing from A.C indoor units to the nearest drain point. **Drawing shall contain tabulation of all measurable items of Equipment/Materials/works.**

- iii) Installation/Working drawings shall be submitted for approval sufficiently in advance of installation of any material to allow MDL Engineer ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce installation/working drawings at the right time, in accordance with the approved program.
- iv) When MDL Engineer makes any amendment in the above drawings, the contractor shall supply 02 fresh sets of drawings with the amendments duly incorporated, for approval. The contractor shall submit further 02 sets of installation/working drawings to the Engineer for the exclusive use by the MDL Engineer.
- v) **4 sets of prints of approved drawings in A3 size to be submitted by the Contractor to MDL.**
- vi) Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the Contractor of the responsibility or requirement to furnish material and perform work as required by the Contract.
- vii) After completion of work, **Contractor shall submit 04 sets of A3 size prints of "as built" drawings and 02 sets on CD-R disc in a PC compatible AutoCAD & PDF format.**

### **C) MATERIALS, DESIGNS, INSTALLATIONS, TESTING & COMMISSIONING**

- i) Inverter split A.C units shall be factory assembled, wired and tested. It shall comprise of Indoor and Outdoor Units along with all the accessories. Copper Refrigerant Piping interconnecting evaporator and Condensing Unit shall be charged with **eco-friendly** gas and be provided with suitable length of Copper Refrigerant Piping with insulation and cabling to be provided per Evaporator Unit.

Condensing Unit shall be suitable for outdoor installation with weather proof enclosure and shall be field serviceable.

- ii) **Contractor to select the model from the preferred list of manufacturers of the Inverter Cassette/split A.C considering the climatic conditions prevailing through the year at MDL Mumbai site.**
- iii) Copper refrigerant piping of suitable diameter compatible with the refrigerant gas & air conditioner model with insulation/nitrile rubber sleeves (19 mm thk), end connections to be installed true to line and level, jointing by brazing & adequately supported intermittently at uniform distance with appropriate clamps / support arrangement including making precise holes in walls with core cutting m/c, providing sleeves & proper finishing for connectivity from indoor to outdoor unit etc all complete as directed by MDL engineer. The alignment of copper piping in horizontal and vertical direction to be maintained.
- iv) Reputed make of ISI mark UPVC plumbing grade condensate drain pipe & fittings to be used for taking out condensate drain water from AC Units up to

the Ground Level including looping/routing .The joints shall be properly sealed so that there is no water leakage. Proper grouping of condensate drain pipes & gradient to be maintained for the easy flow of condensate drain water from the A.C units to the ground level. UPVC pipelines to be adequately supported intermittently at uniform distance with clamps, pipe supports with proper alignment in horizontal and vertical direction.

- v) Unless otherwise specified and approved, all materials and designs shall comply with the current issue of the relevant Indian or International Standard Specifications and their installation shall comply with the relevant current Indian/International Standard Codes of Practices.
- vi) Materials, designs and installations shall comply with the building regulations, local authority regulations and by-laws, Gas Safety Regulations, National Electric Codes for the Electrical Equipment of buildings, insurance company requirements and other statutory rules. All equipment and materials shall be products, which shall meet with the acceptance of authorities having jurisdiction over the work.
- vii) Each item of Equipment/Material shall be a standard catalogue product of an established manufacturer strictly from the manufacturers listed in the list of preferred makes.
- viii) All equipment and materials required for installations shall be new and without blemish.
- ix) The contractor shall raise inspection call to MDL for the works undertaken at below mentioned stages –
  - a) After delivery of material at site before starting of installation works
  - b) After testing & commissioning of the completed works.
- x) All the works under or in course of execution or executed in pursuance of the contract shall at all times be open to inspection & supervision of the MDL engineer / executives & the contractor at all times during the usual working hours offer assistance for the inspection of work.
- xi) The contractor shall submit supporting documents such as delivery challan(s), Test reports / certificates, packing lists, Invoice, Performance guarantee certificates & other technical documentation in requisite sets as relevant along with the invoice for the purpose of certification by MDL engineer.

#### **D) PROTECTION OF MATERIALS AND WORK**

- i) Copper tubes stored on site shall be supported clear of the ground and kept separate from all other stored ferrous materials & shall be suitably protected against the weather.

- ii) All equipments and materials, fixed or unfixed shall be protected against ingress of dirt or moisture into working parts by means of Polythene covers or other equivalent measures.
- iii) Precautions against mechanical damage by other trades shall be provided.
- iv) Precautions shall be taken and all necessary protection provided to safeguard the work during bad weather.
- v) The inlet and discharges of all fan coils, and other terminal units shall be kept covered until all local Plastering, Purging, etc. is completed and the units are ready to run.

Equipment and material damaged shall be replaced by contractor at the discretion of the MDL engineer. Equipment and materials are subject to rejection and replacement, if in the opinion of the MDL Engineer, or in the opinion of the

- vi) manufacturer's engineering department, the equipment has deteriorated or been damaged to the extent that its immediate use is questionable, or that its normal life expectancy has been curtailed.
- vii) The contractor shall be solely responsible to protect all the delivered materials from the time of delivery at site till satisfactory completion & handing over of the completed works from any mode/type of damage/loss that may occur during this period.

#### **E) INSTALLATION LIAISON**

- i) The Contractor is responsible for the co-ordination of all installation work on site. The Contractor shall plan his installation before the work is commenced and to ensure correct installation to the design intent during the course of construction. Any work, which has to be re-done due to negligence in this respect, will not constitute an extra & also shall not amount to Extension of Time to the Contract.
- ii) Contractor has to depute experienced and knowledgeable engineer/supervisors in the field of HVAC who can co-ordinate, execute the work and take site decisions without any delay.
- iii) Particular care shall be taken to obtain uniform and tidy arrangements of wall mounted indoor and outdoor units.
- iv) Where the work of the Contractor has to be installed in co-ordination with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment.

#### **F) OPERATION & MAINTENANCE MANUAL**

Upon practical completion of the works, 04 copies of operation & maintenance

manual shall be provided.

The manual shall contain full operating and maintenance instructions presented in a form to deal systematically with AC units. The manual may contain manufacturer's standard operating and maintenance instructions and leaflets where these are applicable.

The contractor shall furnish Guarantee / warranty certificate of each air conditioner unit duly signed & stamped by the manufacturer, effective from the date of satisfactory completion & acceptance of the completed works by MDL.

## **G) REFERENCE STANDARDS**

Reference standards to be followed shall be of latest versions.

- ASHRAE Standards
- ASHRAE/ISHRAE Hand Books
- Safety Code for Mechanical Refrigeration, ASHRAE
- HVAC Commission Guideline (ASHRAE)
- IS 1239 for Piping

### [PREAMBLE TO THE BILL OF QUANTITIES](#)

#### **1. GENERAL INSTRUCTIONS**

- 1.1 The Bill of Quantities must be read with the scope of work, Conditions of Contract, Drawings and the Specifications and the Contractor shall be deemed to have examined the Scope of Work, Drawings, Specifications, Conditions of Contract and to have visited the Site and acquainted himself with the Works to be done and the way in which they are to be carried out and all factors affecting the execution of the Works and the Costs thereof including temporary works if required to complete the works.
- 1.2 All work shall be measured net as it is finished and/or fixed in the Works and no allowance shall be made for wastage notwithstanding any general or local custom. Any items of work not covered in the Preamble shall be measured as per specifications for works methods laid down in relevant Indian Standards or as decided by the MDL Engineer.
- 1.3 The quantities set down against the items in this Bill of Quantities are an approximate estimate of the quantity of each kind of work included in the Contract and are given for the convenience of forming a common basis for tendering. They are not to be taken as a guarantee that the quantities scheduled will be carried out or required or that they will not be exceeded. MDL reserves the right to delete any item indicated in the bill of quantities at any time.

1.4 The quantities shall therefore not be considered as representing the final measurements, it being the intention of the Contract (except where otherwise specifically stated) that the actual quantities of work ordered and carried out shall be jointly measured on completion by the MDL Engineer or his authorised representative and the Contractor and valued and paid for at such prices and rates entered by the Contractor in the Bill of Quantities.

1.5 The rates and prices set down against the items are to be the full inclusive value of the finished work shown on the Drawing and/or described in the Specifications or which can reasonably be inferred there from and to cover the cost of every description of Temporary Works executed or used in connection therewith (except those items in respect of which specific provision has been

separately made in this Bill of Quantities) and all the Contractor's obligations under the Contract including testing, giving samples and all matters and things necessary for the proper execution, completion and maintenance of the Works. No claim for additional payment shall be allowed for any error or misunderstanding by the Contractor of the work involved.

1.9 **The Specifications and the various Sections in the Bill of Quantities are intended to cover the supply of all the materials and the execution of all works necessary to complete the Works. Should there be any details of Materials or Construction which have not been referred to in the scope of work, specifications, Bill of Quantities or the Tender Drawings, but the necessity for which may reasonably be implied or inferred there from, or which are usual, or essential to the completion of all works in all trades, the same shall be deemed to be included in the rates and prices within in the Bill of Quantities.** The rates and prices shall cover the items as described in the scope of work, Bill of Quantities, tender drawings and other terms and conditions of the contract.

1.10 The Contractor's unit rates and prices in the BOQ shall include

- a) All equipment, apparatus, material, indicated in the BOQ, Scope of Work, Drawings, Specifications in connection with the item in question and also associated labour as well as all additional equipment, apparatus, material, consumables usually necessary to complete the system even though not specifically shown, described or otherwise referred to and also associated labour.
- b) It also includes delivering the material, item to the specified storage area at Site. Installation of the same in the specified location as per Drawing & as specified, testing and commissioning as per Specification and direction of the Engineer' at Site.
- c) The unit price shall be deemed to include every thing necessary to complete the work covered by this item in accordance with the scope of work, BOQ description, Specifications and Drawings.
- d) The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.

- e) All equipment, machinery, apparatus and materials required as well as the cost of any tests which the Engineer may request in addition to the tests generally required to prove quality and performance of A.C units. Further, if any equipment, machinery, apparatus and materials found to not comply/fulfil satisfactory performance/duty during such testing, then cost of replacing such materials.
- f) Use of any tools, equipment, machinery, lifting tackle, ladders consumables etc. required by the Contractor to carry out his work.
- g) All the necessary measures to prevent the transmission of vibration. Storage and insurance of all plant and equipment, apparatus and materials.

## **2. DETAILS OF MEASUREMENT**

### **2.1. UNITS OF MEASUREMENT**

The units of measurement used in this Bill of Quantities are in metric units as follows:

- a. **Linear**            Linear metre, centimetre or millimetre abbreviated to 'RM', 'cm' or 'mm' respectively.
- b. **Numbers**        Numbers abbreviated to No's or No.

### **2.2 INVERTER CASSETTE/SPLIT AIR CONDITIONER**

For measurement and certification of work for Supply & Delivery of wall mounted Inverter Split Air conditioner and Cassette type at site, Contractor & MDL engineer will jointly verify the quantities by opening the boxes/package and verify the same with technical details furnished, damage due to transportation and handling etc before starting the installation work.

Contractor to make all the arrangement for opening and closing of boxes/packages and store the same in proper manner after inspection.

### **2.3 REFRIGERANT PIPING**

Copper piping shall be measured in running meters as actually installed along the centre line of the pipe line including pipe fittings.

Copper piping work for refrigerant would be measured in running meters in one direction from indoor unit up to outdoor unit considering **suction & discharge tubing as one combined set** & excluding the length of copper pipe supplied by the Air conditioner manufacturer as part of the AC unit package. Suction & discharge piping will not be measured separately one from another for certification of work done.

### **2.4 UPVC PIPING FOR CONDENSATE DRAIN**

UPVC piping shall be measured in running meters as actually installed along

the centre line of the pipe line including pipe fittings.