

1 COMMERCIAL AIR CONDITIONING UNITS

1.1. PRELIMINAR CONSIDERATIONS

1.1.1 During the project preparation, specification of materials and equipment, tests of the equipment and installation, should be considered as the latest versions of the applicable documentation and international standards specific to this type of systems.

1.1.2 This Technical Specification has the purpose of definition of technical, construction and installation parameters to be observed in the air conditioning system, designed to meet the conditions of comfort in the environment to be heated/cooled.

1.1.3 For the correct selection of equipment to supply and install should be drawn up a design, as detailed as possible, by a skilled designer, in which shall include at least the following data:

a) Estimate the heat load required, through an appropriate method of calculation and the most reliable way, taking into consideration:

- Climatic conditions of the location of the project;
- Floor, walls and windows areas;
- Orientation of the building;
- Constructive elements: dimensions and materials of slabs, walls, windows, thermal insulation and other;
- Sources of heat dissipation: people, lighting equipment, Electrical / Electronic equipment and other;
- Air infiltration and ventilation;
- Other elements.

b) Selection of type of air conditioning units to provide and install, according to the previously determined thermal load and customer requirements and expectations.

c) Selection of the brand to provide and install, taking into consideration the most prestigious brands, such as the CARRIER, DAIKIN, McQUAY, SAMSUNG, FUJITSU, PANASONIC and other.

1.2. GENERAL CONSIDERATIONS

The following features intend to establish the basic conditions for a perfect supply, being incumbent the Supervision of the Works to its evaluation, adaptation to the specific equipment and complementation to ensure obedience to the standards and safety requirements of the operational efficiency of the installation and the calculations made.

1.2.1 System of Units:

All greatness should be indicated in units of measures belonging to the Decimal Metric System. However, there may be exceptions for items usually manufactured according to other patterns, as is the case of copper piping, sleeve of insulation, screws, nuts and others, that in many times are specified in the British System.

In the event of conflict between the Metric System and other system, the first will prevail.

1.2.2 Drawings, written documents and other:

All drawings and catalogs should indicate, where applicable, the materials used in manufacture, dimensions, finishing, anchorages and other information that they deem necessary to a better understanding and demonstration of compliance with the requirements of these specifications.

1.2.3 Instructions Manual:

The proposed air conditioning units instructions manual should contain at least the following information:

- General index;
- Procedures of the equipment different modes of operation;
- Complete Manual of the manufacturer of each component containing data of installation, operation and maintenance, as well as the spare parts list for later refitting;
- Instructions to the preventive and corrective maintenance;
- If possible, it should also contain a list of agents and/or representatives of the trade marks in question.

1.2.4 Guarantee:

The supplier must ensure that the equipment, from its manufacturing or coming fully or partially from other vendors, comply with the requirements of the specifications, is exempt from

manufacturing, of raw material or workmanship defects. It should also be indicated their Warranty Periods and their scope of application.

1.3 SPECIFICATIONS

1.3.1 Wall mounted split type air conditioner specifications:

Refrigerant Fluid: R 407 c ou R 410 a

Cooled Fluid: Air

Indoor Unit (evaporator):

The indoor unit cabinet should be built in plastic injected structured in stamped galvanized plates. It should be horizontal mounting on the wall and contain manually or motorized adjustable vanes, in inflator of air. The condensate collection tray should be constructed of no combustible and no corrodible material, conformed and installed in order to collect the product of the condensation of the recirculated air in contact with the cold battery fins and avoid water accumulation in its interior.

The indoor unit cabinet should have internal thermal and acoustic isolation.

The serpentine of the evaporator unit should be made with copper pipes and tubes and integral aluminum fins, fixed to the tubes by mechanical expansion, so as to obtain a perfect contact; it should, on the other hand be equipped with manifolds and collectors of refrigerant fluid. This serpentine should be tested against leaks at a pressure of 350 psi.

The evaporator unit installation should be carried out using the mounting plate that accompanies the unit through screw bushings of convenient size.

Outdoor Unit (condenser):

The outdoor unit cabinet should be composed by a metal structure, panels with galvanized steel, protected against corrosion by a process of phosphatization, with electrostatic painting in enamel paint on anticorrosive primer or plastic for high resistance. Panels shall be removable to allow easy access to the interior of the machine and constructed with adequate plate to good stiffness of the assembly. It should receive appropriate treatment to be resistant to the action of the age and the external environment.

The serpentine of the outdoor unit should be made with copper pipes and tubes and integral aluminum fins endowed with coating prevents direct contact with the copper tubes, fixed to these

by mechanical expansion. The serpentine should be tested against leaks at a pressure of 350 psi.

The installation of the outdoor unit must be carried out using proper steel supports that accompany, also, the unit and expansive metal bushings of appropriate diameter or could be installed in another way since that ensure compliance with the indications of the manufacturer.

Fans:

The evaporator fan should be centrifugal and double aspiration type with pads facing forward, constructed of plastic material, aluminum or galvanized sheet steel stamped, statically and dynamically balanced, direct motor driven coupled to the shaft.

The condenser fan may be of low noise and of the axial type with horizontal air discharge. The electric motor drive may be bi or triphase or, depending on the refrigerating power of the air conditioner.

Air Filters:

The generic air filter installed in the evaporator unit cabinet upstream of the serpentine should be of class G1 (as per NB-10178), intended for the filtering particles above 1 micron washable electrostatic nylon and of long duration. However, they may be applied filters with special characteristics in relation to the expectations of the customer and of the project in question.

Compressors:

The air conditioning unit will be equipped with one, two or three compressors depending on their refrigerating power. Generally, the compressors used on these units are rotating multisealed or screw, installed on anti-vibration pads.

The compressors are driven by electric motors, internally protected against overload and adequate to tolerate the voltage variation of up to 10% of the nominal value. These motors are cooled by suction of the refrigerant fluid and are endowed with crankcase heaters. For additional protection in the electrical panels it should be installed components to prevent the inversion of the phases (in the case of three-phase units) or others in accordance with the requirements of the project in question.

Cold Network:

The piping to be applied in the installation of this type of air conditioner should be soft copper until the diameter of $\frac{3}{4}$ " and rigid for bigger diameters. In the first case, the curves should be

performed with the use of appropriate tools . tube bending machine or bending springs - and should be avoided at all cost piping connections along its length. For the case of use of rigid piping it should be used appropriate accessories and the connections must be conveniently welded and inspected.

The connections between the indoor and outdoor units should be used short nuts and/or appropriate flanges.

In the case of uneven between the evaporator and the condenser, it should be provided traps, entails the ascending flow at least every 3 meters.

Suction and of liquid pipes should be isolated, together or separately, with rubber foam sleeves (for example, Amaflex), which may contain mechanical protection (aluminum pipe, plastic or other technical runner) when the installation to occur outside the buildings. Whenever there is a need for this piping crossing any wall, should be done through wall protectors of adequate size to the same.

Condensate Drainage Piping:

The piping for the condensate drainage must have a diameter that allows an easy discharge by gravity of all the condensate that are formed and are collected in the condensate tray referenced above. The flow of condensate can be done directly to the outside or being forwarded to a previously defined network for the collection of condensate to re-use it in other operations.

Where there is a need for this piping crossing any wall should be properly insulated to prevent the action of humidity on the wall.

In cases in which the gravity flow is not possible, should be provided a condensate pump compatible with the air conditioner to be installed. Each manufacturer has available to its range of appliances compatible condensate pumps.

Temperature and humidity control:

The control of temperature will be done on the basis of a thermostat - electromechanical or electronic - installed in the indoor unity; the same comes calibrated by the respective manufacturer and has characteristics to provide comfort to the users of the space where the unit is installed.

Usually, in small units no device exists for the humidity control, which is necessary for projects of installations for compartments of controlled environment - clean rooms, laboratories, meeting rooms, operations theatres and other.

2 VENTILATION / EXHAUST

2.1 PRELIMINAR CONSIDERATIONS

- 2.1.1 During the project preparation, specification of materials and equipment, tests of the equipment and installation, should be considered as the latest versions of the applicable documentation and international standards specific to this type of systems.
- 2.1.2 This Technical Specification has the purpose of definition of technical, construction and installation parameters to be observed in the air ventilation and renewal systems, designed to meet the conditions of comfort in the environment.
- 2.1.3 For the correct selection of equipment to supply and install should be drawn up a design, as detailed as possible, by a skilled designer, in which shall include at least the following data:
- a) Estimate of the capacity of the equipment, through an appropriate method of calculation and the most reliable way, taking into consideration:
 - Recommendations for the number of exchanges per unit of time, taking into account the use of each space in particular;
 - Volume of the compartment to be served;
 - Constructive elements for the definition of the type of equipment to be used for each particular case.
 - b) Selection of the brand to provide and install, taking into consideration the most prestigious brands with confident locally established agent and whenever possible with after sales technical support by an established representative.

2.2. GENERAL CONSIDERATIONS

Nowadays, people are increasingly aware of the problems of pollution of the interior spaces and the important contribution that well-planned ventilation has to modern life. Effective ventilation is considered as a necessity to ensure an internal air with better conditions for the life and work, free from objectionable odors, smoke, humidity, excessive heat, etc.

The characteristics described hereinafter wish to submit the basic conditions for a perfect supply, being incumbent upon the supervision to its evaluation, adaptation to the specific equipment and complementation to ensure obedience to the standards and safety requirements of the operational efficiency of the installation and the calculations made.

2.2.1 System of Units:

All greatness should be indicated in units of measures belonging to the Decimal Metric System. However, there may be exceptions because many manufacturers have been using in their products range Catalog other base units. For conversion of the units between the Decimal Metric System and the British System it is recommended the following table:

Description	Metric System	British System	Factor
Length (L)	Meter [m]	Foot [ft]	0,305
Mass (m)	Kilogram [kg]	Pound [lb]	0,4536
Temperature (T)	°C	°F	(t-32) x 5/9
Velocity (v)	Meter per Second [m/s]	Foot per Minute [ft/min]	0,00508
Volumetric Flow (Q)	Cubic Meter per Second [m³/s]	Cubic Foot per Minute [cfm]	0,000472
Pressure (p)	Pascal [Pa or N/m²]	Inch of Water Column [in.w]	249

Rotation (n)	Rotation per Second [rps]	Rotation per Minute [rpm]	0,01667
Electric Current (I)	Ampere [A]	Ampere [A]	1
Voltage (V)	Volt [V]	Volt [V]	1
Power (P)	Watt [W]	Horse Power [hp]	746
Density ()	Kilogram per Cubic Meter [kg/m ³]	Pound per Cubic Inch [lb/in ³]	16.02

2.2.2 Drawings, written documents and other:

All drawings and catalogs should indicate, where applicable, the materials used in manufacture, dimensions, finishing, anchorages and other information that they deem necessary to a better understanding and demonstration of compliance with the requirements of these specifications.

2.2.3 Instructions Manual:

The proposed air ventilation/ exhaust units instructions manual should contain at least the following information:

- General index;
- Procedures of the equipment different modes of operation;
- Complete Manual of the manufacturer of each component containing data of installation, operation and maintenance, as well as the spare parts list for later refitting;
- Instructions to the preventive and corrective maintenance;
- If possible, it should also contain a list of agents and/or representatives of the trade marks in question.

2.2.4 Guarantee:

The supplier must ensure that the equipment, from its manufacturing or coming fully or partially from other vendors, comply with the requirements of the specifications, is exempt from manufacturing, of raw material or workmanship defects. It should also be indicated their Warranty Periods and their scope of application.

2.3 **ESPECIFICATIONS**

2.3.1 The simpler method to determine the capacity of the required equipment to provide and install will be the volume calculation of the room to deal with and multiply it by rate of air exchanges recommended for this location, according to the table in the Annex; the value obtained will be in m³/h. If there is the need, on the convenience of analysis, the convert to l/s, the result must multiply by 3,6.

2.3.2 Each individual produces its own part of heat, water vapor, carbon dioxide and body odors. In general, in the warm season/ summer, the ventilation requirements for the last item will cover the needs of the other three magnitudes, except in the case of sharp agglomeration of people in a given bay, in which the freshness average acceptable is not reached and the average concentration of odors should be reduced. This means that the supply of fresh air per person should increase with the number of people in a given compartment and, consequently, the rate of air exchanges must also increase.

2.3.3 On the basis of experience gained with time, with the aim of offering better living conditions the authorities that deal with this issue recommend renewal rates of air (ach . air changes per hour) as the table on the following page. Attention to the case of Auditoriums, Cinemas and Theaters that should be carefully checked to ensure a minimum volume of air of 28 m³/h per person to prevent odors become annoying. In these cases, it should also be paid attention to the content of carbon dioxide in the air coming from the breath of persons; this value must not, under any circumstances, be greater than 1 part by 1000.

2.3.4 The values shown in the table should be increased by 30% in the case of rooms are intended to be used by smoking persons.

2.3.5 The type of equipment to be provided and installed depends in the final analysis, the structural conditions of the room. There are several types of units:

- Wall mounting;
- Window/ glass mounting;

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- False ceiling mounting;
- on line in rigid or flexible ducts with grids on the ends;;
- Industrials;
- Others.

- 2.3.6 The triggering mode can also be chosen between located, individual, automatic, with specific sensors (humidity, timer, air quality, controller of group, lighting), etc.
- 2.3.7 To take in account the effect of dust and odors in a regular office can usually be ignored in the design of an installation knowing that the rate of renewal of air to offer comfort conditions based on temperature, humidity and air movement will always be 4 to 6 times higher than the rate for the removal of dust and odors up to an acceptable level.