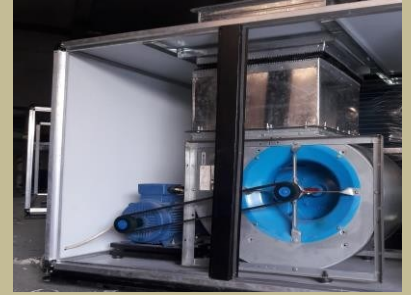


AMCO

INDUSTRIES

# MM-ENGINEERING

## AIR HANDLING UNITS



AMCO

INDUSTRIES

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**Centrifugal Fans Double Skin Type  
For JPMC Karachi 8000 CFM@ 2.5''WG  
Fresh Air DWDI- FC**



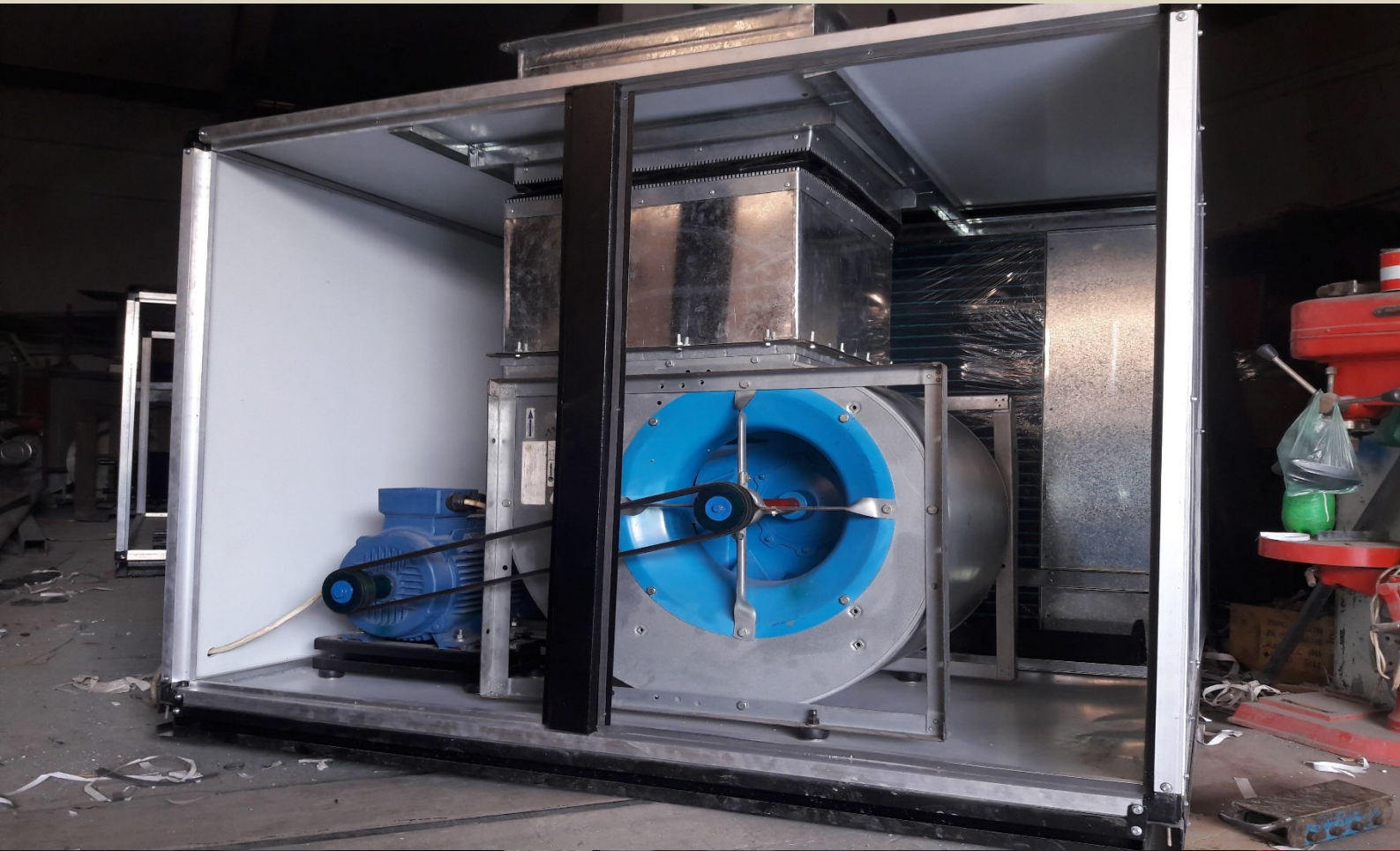


# Exhaust Air Fan for JPMC Karachi 8000CFM @ 3.5''WG





**100@ Fresh Air AHU Aquafina Super Highway**  
**Double Skin with Cooling Coil**  
**Cap -7500 CFM @6.5''WG**  
**Cap -2500 CFM @ 6.5'' WG**





# MM-ENGINEERING AIR HANDLING UNITS

AMCO

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Disclose the Secret of Fresh Air:



MM-ENGINEERING has been taking care of indoor air quality (IAQ) as an essential resource since 1997.

Today MM-ENGINEERING is one of the leading ventilation company. A success story, which started in Karachi Pakistan. Invention of the Air Handling Units (AHU), Pulse Jet Type Dust Collectors, Industrial Fans, Air Curtains & Air Filters etc. Since then the company has continuously advanced & now offers the comprehensive range of products for all ventilation requirements. The expert at MM-ENGINEERING have the require knowledge & understanding in finding solutions when considering the ventilation of Shopping Centers, Domestic ventilation of a Family Home to the Complex ventilation of Tunnels & Metro Station.

Introduction:

MM-ENGINEERING indoor air-handling units (AHUs) have no limits. Our engineers have developed an AHU line that is so flexible and able to deliver such high standards of performance, that it can handle virtually any application. Whatever the air-handling challenge—IAQ, acoustics, energy, controls, you name it – MM-ENGINEERING can build an AHU that will meet your needs.

**An AIR HANDLING UNIT (AHU)** is a machine that Conditions (i.e. heats, cools, cleans, &/ or humidifies) and circulates air in a House or Building. AHUs are components of complete heating, Ventilation & Air Conditioning (HVAC) systems.



## Product Range:

MM-ENGINEERING has an extensive range of ventilation products, the majority of which are Air Handling Units, Industrial Fans Pulse Jet Type Dust Collectors & Scrubbers etc.

Other products include a wide range of Air terminal devices for various applications. These products are installed in variety of locations, including Homes, Offices, Healthcare Premises, Shopping Centers, Industrial Buildings, Tunnels, Training Facilities, Sports centers etc. The most common usage is comfort ventilation, but safety ventilation in various forms is also an important market.

Smoke gas ventilation & tunnel ventilation are two examples.

### Fans:

MM-ENGINEERING is one of the largest suppliers of fans for use in various types of property.

Our range include everything from duct fans with around connection the company's original product- to rectangular duct fans, roof fans, axial fans, explosion-proof fans, & smoke gas fans.

These fans can be supplied in sizes suitable for everything from ducts with a diameter of just 100mm to large road tunnels fans. All our fans have been developed to comply with stringent requirements and are characterized by user friendliness a high level of quality & a long service life.

### Circular Duct Fans:

Duct fans with a circular connection.



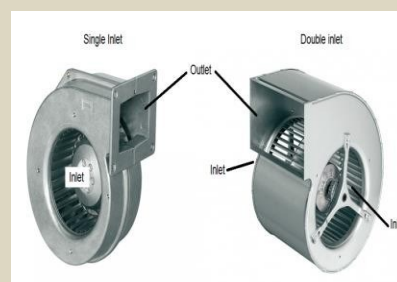
### Rectangular Duct Fans:

Duct fans with a rectangular connection.



### Radial Fans:

Single & Double inlet Radial Fans.



### Box Fans:

For extract air system that transport normal or high-temperature media.



### Axial Fans:

Axial for duct connection or wall mounting.



### Roof Fans:

Roof fans with a circular or square connection.





condition of up to 600°C for 120 minutes.



## Description of the Air Handling Unit

### Casing:

The metal enclosure that all the components contained in the MM-Air Handling Units is sturdy & has no protruding items to disturb the overall look of the unit.

Air Handling Unit with a smaller cross section (AMCO-2 to AMCO-18) have a frame composed of an aluminum section that outlines the equipment's edges perfectly, resulting in a solid, robust & attractive overall look.

These aluminum extruded sections are joined by injection molded fiberglass-reinforced plastic angle cleats.

In Air Handling Unit with a larger cross section (AMCO-23 to AMCO-70), the assembly includes a frame composed of a specially shaped section of extra-thick steel with high bending strength, due to the pleats in frame. These pleats create the housing of the closing panels, leaving an outer beveled edge.

In these larger sizes, the sections are joined together by angle cleats manufactured of die-cast aluminum. The assembly is anchored by slot screws, obtaining a solid, sturdy structure.

The frame enclosure is based on the use of AMCO sandwich panels comprising two pieces of galvanized sheet one inside the other.

The inner rack is manufactured of galvanized steel sheet, whereas the exterior rack of the same material has a baked-on pre-enamel finish in the characteristic.

The space created by the connection of two racks is filled with an injected polyurethane foam insulation to insure excellent thermal and sound insulation that prevents heat transfer, noise transmission & potential condensation.

The injection-molding process is done with the panel introduced in a press with hot plates, which promotes polymerization & avoids panel deformation due to the expensive strength of the polymer.

This method results in a mechanical stiffness well above that of other panels filled with other type of insulation (even when the panels have thicker sheets), as the adhesion of the chemical foam to the metal sheet significantly increases the mechanical strength.



This type of insulation has become extremely popular & is the unquestionable market leader in Pakistan.

Polyurethane foam was introduced many years ago for the insulation of air handling units. Anyway we use rock wool or fiber glass upon request.

The construction approach used in our MM-ENGINEERING air handling unit has become a market leader since its introduction in the late 1997s.

The AMCO Panels are manufactured in two nominal thickness.

- 25 mm, which are the standardized panel, and
- 35mm & 50 mm, which meets specific needs requiring greater heat insulation.

The 25-mm thick AMCO panels are mounted on the two structures mention above.

The 50-mm thick AMCO panels are mounted on a frame composed of an aluminum profile of 70 X 70 mm, which outlines the equipment edges precisely. Due to its width, the 50-mm AMCO panel is flush with the extruded aluminum frame, providing an overall solid, robust, attractive appearance.

The frame sections are joined by angle cleats manufactured of die-cast aluminum.



Corner detail.

The above solution is applicable to all AMCO model with a 50-mm panel (AMCO-2 to AMCO-70).

Regardless of the type of structure, all AMCO panels on the access side can be easily dismantled, there by facilitating access to the internal parts of the air handling unit by the maintenance staff. By special order the AMCO panels can be constructed with a different shape for specific needs.

All internal components of the air handling units are secured to the structure & the AMCO panels by butts of galvanized sheet. These butts have varies shapes, based on the specific component.

The finished equipment can have a bedplate composed of

Channel sections or feet. Based on the project needs, it can Also be set on shock absorbers when vibration must be avoided. The enclosure described contains all the air handling unit Sections, which can include some or all of the ones described below:

### Inlet section:

This section is composed of a standardized section with an air Inlet to the air handling unit. This opening can: Provided.

- Use a volume control damper, that can be equipped for Manual operation or for subsequent automation.
- Be protected by an air shutter.
- The combination of the previous two.
- Be equipped with a simple inlet consisting of a straight Flange for easier duct connection.

In addition, a cover to prevent water from entering when the Equipment is placed outdoors can be provided.



### Mixing section:

This has similar features as the above and two openings, each of which contain a control damper.

These dampers can be supplied with an extruded aluminum Section construction. There are two models of aluminum Section, one with an airfoil blade. The operating mechanisms for all dampers are installed in the Channel frame. This allows air to circulate freely and facilitates Installation in closed ducts. The mechanisms and fasteners are made of corrosion-resistant materials.



The operating mechanism of the dampers may be manual or equipped for motor-driven operation. In the latter case, upon request and depending on the damper size, these controls can be supplied interconnected so they can be operated by a single servo drive.





### Free cooling section.

This section requires a return fan and a supply fan. These fans must have three dampers in between, with the dampers used to regulate the volumes of exhaust, return and outside air.

Therefore, in order to meet their purpose the dampers must be motor-driven.

When the enthalpy of the outside air is less than the enthalpy of the recirculated air, i.e., during spring and autumn, the mixture of outside air and recirculated air is controlled to achieve free cooling.

Consequently, the relative opening of the dampers is determined by an enthalpy (or dry temperature) comparator, which sends the respective signal to the damper motors.

In order to ensure the minimum ventilation air required in cooling or heating seasons, the outside air inlet damper can be split into two sections (one motor-driven and another manual that remains fixed). The cross-section of the damper will be proportional to the minimum ventilation air flow.

This effect can also be achieved more economically by adjusting the stroke of the motor operating the outside air damper so it does not close completely.



### Filter section:

The following sections of filters are included in the AMCO Air Handling Unit standardized range.

- **Extended surface filters**, in which the filtering mat is mounted in Pleated or zigzag fashion. As a result, the filtering area is larger, the air flow rate is low, and the service interval for replacement or cleaning is longer.

The filtering efficiency is low; and therefore the unit can be used in systems for human comfort where the atmosphere has a low level of contamination.



- **Bag filters**, which can be flexible or stiff and have a medium or high filtering efficiency, depending on the class.

The bag filters have an individual frame and airtight seals.

They are particularly recommended for installations requiring extra-pure air.

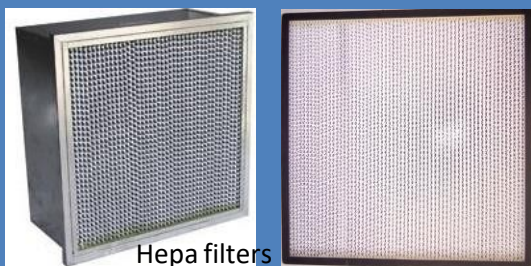
The bag filters are generally preceded by a pre-filter section of lower efficiency (e.g., extended surface filters). This approach extends the service life of the bag filters, which are more costly and must be replaced, as they cannot be regenerated.

- **Absolute filters**, with an efficiency of almost 100% as indicated by the name. They are equipped with an individual frame and airtight gaskets.



Bag filters

Similar to the other filters, which must contain a pre filter Section upstream, the profilers' should be high efficacy filters to ensure a longer service life. They are costly and cannot be re-used.



Hepa filters

### Cooling/heating section:

The cooling and heating units are composed of the enclosure described above, which contains the tube-and-fin heat transfer unit, mounted on a special joint cover.

For air cooling processes, units composed of copper pipes and aluminum fins (Cu/Al) are normally used. At the bottom, the cooling section has a stainless steel pan for collecting condensation and a small hose to drain the condensation toward the outside. The pan is slightly tilted for easier drainage, in order to prevent the proliferation of harmful bacteria such as Legionella pneumophila.

Direct expansion units are also used for cooling. These units can be equipped with one or two manifolds.



Cooling/heating coils



For heating processes, the same type of copper/aluminum units used for cooling is normally used.

If the air might contain corrosive chemicals, copper tube and fin (Cu/Cu) units should be used to improve the corrosion resistance of the equipment. This type of unit is more expensive than the copper/aluminum unit. In facilities where the heating fluid is at high temperature and pressure (e.g., steam, superheated water or special thermal fluids), units composed of steel tubes and fins (Fe/Fe), which have a much higher strength, should be used. This type of unit is more expensive than the copper/aluminum unit. Electrical heating units can also be installed upon request, depending on the customer's needs.

### Germicide section:

We can analyse the use of a germicide section to improve the quality of the air supply only upon request.

An adequately designed germicide section should ensure that all bacteria flowing through the system are subjected to the bactericidal radiation necessary for its disposal.

The emitters should be installed in areas prone to bacterial growth, such as cooling units, drip pans and other moist areas, in other words, in any parts that have adequate conditions for bacteria development.

The use of this equipment will improve the air quality of the treated environments, as well as the heat exchanger efficiency of the units, minimizing the need for cleaning and maintenance of the units and the drip pan.

If the specified exposure times are used, these emitters can attack microbes on surfaces or suspended in the air that are growing, circulating or being distributed in the air handling units, and which are largely responsible for allergies and other air-borne diseases.

### Access section

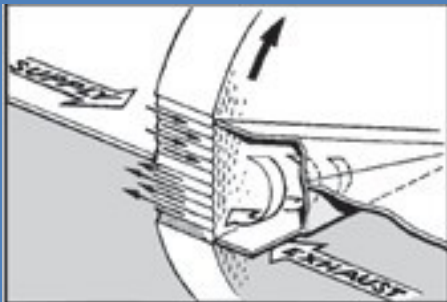
This section, which has a hinged access door and is equipped with an enclosure and handle, is sandwiched in the air handling unit configuration to allow access to the lower parts that require surveillance or regular maintenance.

It may also be used to hold any type of auxiliary component, such as a perforated jet humidifier for direct humidification with steam, or other types of components.



**Rotating regenerative air-to-air recovery unit**, specially designed to transfer sensitive (temperature) and latent (humidity) heat from the exhaust air to the supply air.

The supply air stops in one of the halves of the heat recovery unit, while the exhaust air circulates in counter flow through the other half.



When the impeller turns, the small air flowing channels comprising the impeller are alternately in contact with clean air and with return air, transmitting heat and moisture from one circuit to the other.

**Static recovery unit** with air-to-air crossflow designed to transfer sensitive (temperature) heat; in this type of heat recovery unit, the supply air is completely separate from the exhaust air, in order to prevent any type of contamination from one air stream to the other. Heat transfer takes place through the plate separating the two streams. Two adjacent plates form a small duct for exhaust or supply air.

The plate-to-plate distance varies, depending on the size and efficiency requirements.

**Recovery unit composed of a dual unit in a closed air-to-air circuit.** Designed to transfer sensitive (temperature) heat, using units manufactured with copper pipes and aluminum fins (Cu/Al).

The method is simple and economic, as the return air flows through one of the units, heating the water that circulates inside and is then exhausted.



the air while it cools the circulating water, with the latter heated again in the return circuit, creating a continuous sensitive-heat recovery cycle in the air.

In order to ensure proper system operation in winter, facilities with an extremely low outside air temperature must use glycol water.

#### **Benefits achieved from the installation of any of these heat recovery systems:**

- Reduced heating plant power, minimizing equipment sizes in terms of boilers, fuel tank, circulating pumps, heat pipes and heating units.
- Reduced cooling plant size (compressors and condensers or cooling towers), circulating pumps, pipe grid and cooling units. Savings in operating power consumption for heat and cold generation.

Any of the recovery systems mentioned in this section can be installed upon request only, as they are not included in the AMCO standardized range.

#### **Humidifier section:**

Two different types of air humidifiers can be installed in our air handling units. In both cases, the units are adiabatic humidifiers.

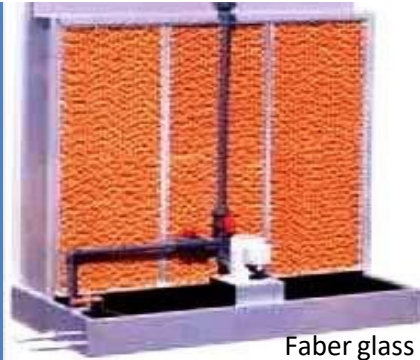
**Panel humidifier**, composed of a standardized enclosure, including a stainless steel drip pan at the bottom.

The enclosure houses the humidifier panel, which has crosswise corrugated channels to ensure minimum air resistance as well as a large contact surface between the air and water, thereby releasing moisture into the circulating air.

The top of the panel contains a water manifold, to which the water is pumped through the pipework from the drip pan by means of a small submersible electrical pump. Water is distributed vertically by gravity, coating the entire inner panel surface with an extremely fine film. As the air flows by the panel horizontally through the spaces provided, turbulent flow conditions are established, thereby resulting in efficient transfer of heat and moisture.

The humidifier panel is manufactured of two different types of material:

- **Fiberglass.** Mixed with structural additives for stiffening. Fiberglass is the material we recommend for the construction of equipment with materials accepted by current regulations, as it helps prevent the appearance of Legionella.
- **Cellulose.** With chemical additives, allowing it to absorb water without affecting its stiffness.



Faber glass

Usage is not advisable, since current regulations recommend that materials promoting the development of bacteria and fungi be avoided (e.g., leather, wood, fiber cement, concrete or cellulose derivatives).

Legionella is an aerobic (oxygen-requiring) bacterium that causes two critical forms of disease in humans:

- One form is known as “Legionnaire’s disease” and affects the lungs, causing high fever. It is serious and can be fatal in many cases.
- The other, milder form is known as “Pontiac fever”.

These bacteria are found naturally in aquatic media and enter the human population through the public water mains.

The conditions required for proliferation are:

- Presence of a substrate acting as a food source (e.g., grime, algae, microorganisms, iron oxides, calcium, magnesium or silicon salts)
- Appropriate temperature.

The bacterium is carried through the air in water droplets.

Droplets between 1 and 5 microns (aerosols) provide the necessary conditions for human infection.

Infection takes place through the airways.

Ways to prevent infection:

- Water treatment with disinfectants to ensure quality.
- Periodic testing of the physical, chemical and biological parameters of the water.
- Periodic cleaning and disinfection of the installation to ensure safe operation.

**Air scrubber**, composed of an enclosure with a large drip pan at the bottom.

The tray contains enough water to create steady state conditions in the scrubber system and is equipped with hoses to connect the circulating pump (supplied



Cellulose

When requested by the client) and water supply, drain and overflow fittings.

The inside contains a distribution branch with water spray nozzles. Two distribution branches are used to increase the efficiency of the humidifier.

A drop separator with blades designed to hold drops in the air is installed on the air outlet side, ensuring that no drops are carried to other sections.

In order to prevent leaks of water, the entire section is watertight and has an access door equipped with a sight hole for visual inspection.

This type of air scrubber can be manufactured entirely of reinforced polyester (both the enclosure and the drip pan) to prevent corrosion.

The equipment that includes the air scrubber comes with a bedplate composed of steel channel sections which are used to support the entire air handling unit.

The air scrubbers are installed exclusively by special order, as they are not included in the AMCO standardized range.





This section is composed of a double inlet cone centrifugal fan with an anchor bedplate, drive and electric motor or plug-fan.

If centrifugal fan motor assembly is mounted on Silent bloc bushings and the discharge outlet is joined to the opening in the enclosure by means of a flexible synthetic seal.

This allows the unit to run without external transmission of the small vibrations normally caused by fan motor assemblies.

The standardized AMCO air handling units can contain three different types of fans:  
Two of them have forward-facing impeller blades and are used in facilities designed to run with low-pressure air flow. These fans are identified with the AT and ADH codes.

The third, which has backward curved blades and is designated RDH, is used for facilities with medium- or high-pressure air flow.

The three types of fans are carefully manufactured, which ensures perfect operation, as perfect static and dynamic balance.

The motor –fan drive is composed of pulleys & v-belts.

The air discharge outlet of the fan section has a straight tab for easier connection to the duct system.

In some cases where the noise level of the facility should be minimized, the inside of the panel is covered with a sheet of perforated plate equipped with pleats, that contains a fiberglass insulating layer with neoprene film on the exposed side to prevent particle creep.

This assembly is secured to the standardized panel by tubular rivets, obtaining a fan section that can absorb most of the noise generated by the fan motor, in this case radiated sound pressure.



The baffles of the silencer section are constructed of natural galvanized steel sheet, with a peak at the air inlet end to decrease the head loss. The baffles are also filled with a sound-insulating material composed of fiberglass with an appropriate density. This material is also heat-resistant and its outer face is protected against air erosion.

There are two options:

- **PA.** The sound insulation is protected against erosion due to air flow by a flame-retardant protective layer.

This is the most common approach in ventilation and air conditioning systems.

- **PAM.** Equal to PA, but with an additional polyester-film coating (Melinex).

Used for applications with acidic, alkaline or oily gases, as it can be steam-cleaned. Recommended for hospitals, since bacterial colony formation is not possible.

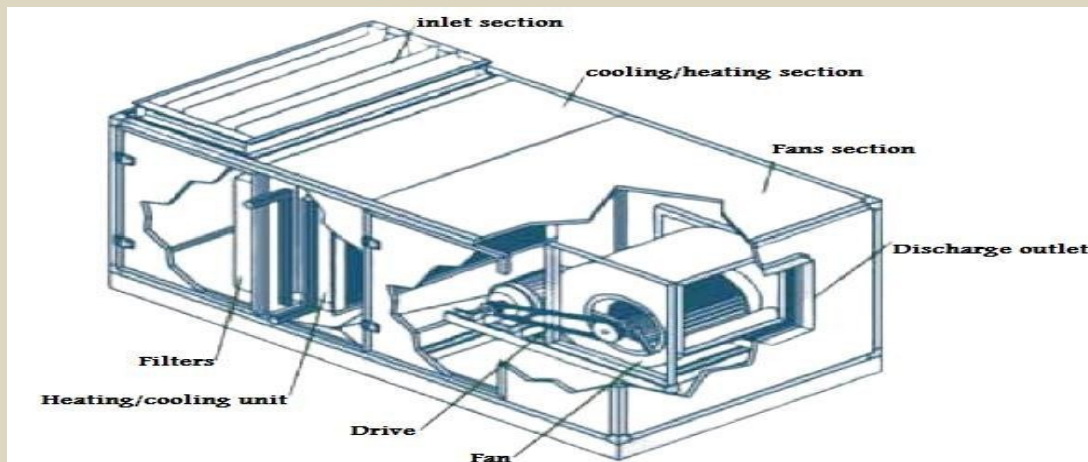
These two models can be constructed with four lengths of baffle.

## Special sections:

In addition to the standardized sections, other special sections that meet specific requirements can be analyzed by special order and included in the air handling unit assembly designed expressly for the conditions of your project.



designed to handle 1 to three times the normal air handling unit flow rate between 200 CFM to 120,000 CFM or above .



The use of three types of double-inlet centrifugal fans allows the equipment's to be selected for use in low medium or high-pressure air systems, depending on the project characteristics.

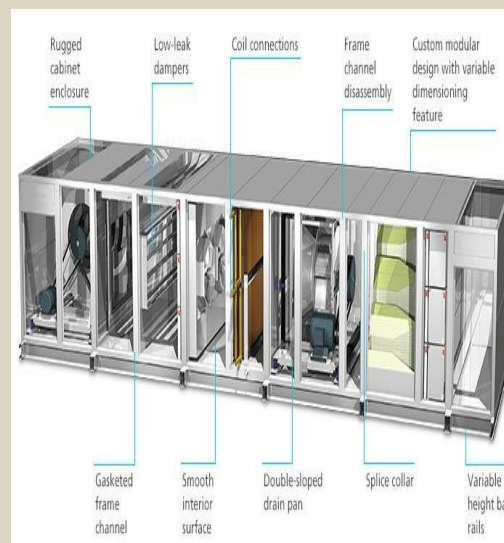
A set of 19 will differentiated sections complete the assembly to allow the intake of outside air, mix it with returned air, filter it, heat it, humid it, recover heat, provide access to the equipment interior etc.

Serval options are also available for the heat exchangers. The most common used cooling media are:

Chilled Water, Glycol Water, Direct Expansion of coolants, etc.

An extensive range of air filter can handle a variety of filtering needs like pre filters, bag filters & Hepa filters etc. From simple impurity filtering to absolute filtering, within the limits established by the manufacturer for the filtering media.

The use of two types of standardised humidifiers allows the media to be freely selected. Furthermore, additional sections can be used to mount any type of humidifiers available on the market.





## PROFESSIONAL

Flexible solution for custom applications

### Flexible design:

MM-ENGINEERING professional's air handlers are tailored to your needs, optimizing always the unit for the most cost-effective selection and manufacturing standardization.

»Air flow from 500 m<sup>3</sup>/h or 295 CFM up to 144,000 m<sup>3</sup>/h or 84,720 CFM.

»All the units can be modularly designed to facilitate the transport and the assembly on site.

»May be design at customer requirement.

#### Variable Dimension:

Size	Air Flow (m <sup>3</sup> /h)/	CFM-Cu.ft/min	Height -mm	Width -mm
AMCO-05	900	530	640	720
AMCO-010	1,800	1,059	640	720
AMCO-011	2,200	1,295	640	810
AMCO-012	3,500	2,060	740	980
AMCO-013	5,400	3,178	840	1,190
AMCO-014	6,600	3,883	840	1,390
AMCO-015	7,600	4,472	940	1,390
AMCO-016	9,000	5,295	1,090	1,380
AMCO-017	11,000	6,472	1,150	1,550
AMCO-018	14,000	8,236	1,270	1,720
AMCO-019	18,300	10,767	1,390	1,970
AMCO-020	23,,800	14,003	1,570	2,190
AMCO-021	29,800	17533	1,690	2,480
AMCO-022	33,800	19886	1,870	2,510
AMCO-023	43,200	25416	1,990	2,940
AMCO-024	51,000	30005	2,110	3,230
AMCO-025	63,000	37065	2,290	3,620
AMCO-026	68,000	40006	2,290	4,410
AMCO-027	77,000	45301	2,290	4,410
AMCO-028	87,000	51185	2,410	4,660
AMCO-029	95,400	56127	2,470	4,960
AMCO-030	1,11,200	65423	2,590	5,460
AMCO-031	1,27,000	74719	2,650	6,060
AMCO-Special	Customized at your request or as your design.			