



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

Section 15000 – Factory Packaged Custom Air Handling Unit.

Part 1 –

1.1 – General

- A. Provide a total price to provide all equipment and services specified in this section.
- B. Catalog, cuts, equipment performance curves etc for each piece of equipment shall be included.
- C. Clearly indicate with Bid :
 - (1) The number of Calendar days after receipt of award when shop drawing would be furnished and
 - (2) The firm delivery days for each piece of equipment.
- D. Indicate the cost of shipping and insurance for all equipment furnished.
- E. Provide a list of any exceptions taken to the requirement of these specifications.

1.2 – Submittals

- A. Four sets of submittals shall be provided for all units. No changes in the unit design shall be made without additional submittals.
- B. Submit Manufacturer's technical product data for air handling units showing dimensions, weights, capacities, ratings, certified fan performance curves, with operating points clearly indicated, required clearances, field connection details and methods of support. Include in the submittal the following for each supplied components:
 - 1. Manufacturer's name and model number
 - 2. Drawings with complete dimensional data
 - 3. Materials for construction
 - 4. Certification, performance guarantee and warranty information.
- C. Four sets of complete operations and maintenance manuals shall be provided. The manuals shall include a table of contents, specifications, drawings including exploded view of parts, and description of equipment, model number of each piece of equipment, installation instructions, operating instructions, maintenance instructions, parts list, test data, performance curves, and warranty. Include instructions for lubrication, filter replacement, motor and drive replacement and spare parts list.

1.3 - Quality Assurance

- A. The Owner shall maintain the right to tour the manufacturer's plant anytime during fabrication of the units specified herein. The vendor shall provide a fabrication schedule to the Owner and keep the owner informed of any changes in the schedule.

EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

- B. Comply with the current editions unless noted otherwise, of all the following:
1. ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers.
 2. ASTM – American Society for Testing Materials.
 3. NFPA – National Fire Protection Association.
 4. OSHA – Occupational Safety and Health Act.
 5. AMCA – Air Moving and Conditioning Association
 6. ADC- Air Diffusion Council.
 7. UL – Underwriter’s Laboratories, Inc.
 8. SMACNA – HVAC Metal Duct Standards, 1985 Edition.
 9. IES- Institute of Environmental Sciences.
 10. IRI – Industrial Risk Insurers.
 11. NEC – National Electric Code.
- D. The Air Handling Unit shall be ETL Listed as complete unit and shall bear the ETL Label.

1.4 Shipment, Storage & Handling

1. Units shall be completely cleaned and vacuumed. All pipe and duct openings shall be plugged or covered in such a manner to prevent entrance of foreign matter. Units shall be delivered with factory installed shipping skids or lifting lugs. Items/Components that are shipped loose shall be packed in separate protective packages.
2. The Air Handling Unit sections shall be shrink-wrapped prior to shipment using 10 mil. Plastic sheet. All openings shall be suitably protected during shipping. Prior to the shipment from the factory, the manufacturer shall inspect the insides of each unit and clean inside surfaces that have visual appearance of oil, dirt, dust, rust, chips or grease.
3. Store Air Handling Units in safe, clean and dry place and away from construction traffic.

PART–2 Products.

2.1 Acceptable Manufacturers: EB Air Control or Approved Equal.

2.2 Air Handling Units

2.2.1. Unit Base

The entire unit shall be assembled on 4”/5”/6” high Channel out of structural steel with integral cross support members designed to carry the component load. The base cross members shall be sized to keep the structural integrity of the base frame during rigging and handling.



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

After construction the base shall be cleaned and painted with a rust inhibitor paint. The base frame shall have properly located lifting lugs, which are an integral part of the channel allowing ease of rigging and insuring the unit frame does not deflect more than 1 inch for 15 ft. of span.

2.2.2 Cabinet / Housing

The unit shall be constructed out of 2”3”/4” thick wall and roof panels. The panels’ outer skin shall be made out of 16G-18G Solid, Satin Coat Steel Sheet in accordance with ASTM-653, and Commercial quality, hot dip Galvanized steel with ZF75 Zinc-Iron Coating to Triple Spot test Method. The panels’ inner skin shall be made out of 22G Perforated Galvanized Steel Sheet made with ASTM-653, Commercial quality, **G90 coating** equivalent to Z27 measured in accordance with Triple Spot Test method. Sheet perforated to 3/32" @ 3/16" staggered and 23.0% open. The panels are to be joined together with self-tapping screws / rivets with 100% solid cross linked butyl preformed rubber sealant type Tremco 440 tape between each panel and then caulked to prevent water and air leakage.

The housing panel deflections are limited to 1/200th of the span dimension while under positive and negative pressure.

The exterior panels shall be fastened to the base by self tapping Tex screws/rivets on Z strip installed around the perimeter. The Z strips will be stitch weld to the base floor with Tremco tape between Z strip and base of panel. This will be continuously caulked with Vulkem 116 gun grade polyurethane sealant conforming to US Federal & ASTM specifications in water and humid areas like drain pan & humidifiers, and with Thermoplastic Elastomeric sealant Tremco 830 sealant in general areas. Z strip to be mitered at time of assembly before being clamped into position for assembly. The two panels shall be joined by High Density Urethane foam tape type Tremco 920 specifically developed as a spacer for structural system.

2.2.3 Coil Removable Panels

All coils shall have bolted removable panels to facilitate easy access and removal of coils.

Panel Noise Characteristics

The acoustical performance of the panels shall be equal to or better than the following sound Power Level (re 10⁻¹² Watt)

Octave Band Hz	63	125	250	500	1000	2000	4000	8000
Radiated Through Casing	x	x	x	x	x	x	x	x
Fan Inlet/Outlet	x	x	x	x	x	x	x	x



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

2.2.4 Unit Floor

The unit floor shall be constructed of 1/8" thick checkered MS or Aluminum plate. The unit floor shall be welded to the base channel. The supply air and return air openings shall have 2 inch duct connecting flanges. Underneath the unit, floor shall be 20-22 Gauge galvaneal liner of Satin Coat Steel Sheet in accordance with ASTM-653, Commercial quality, hot dip Galvanized steel with ZF75 Zinc-Iron Coating to Triple Spot test Method with 3" thick -3 pcf density unfaced insulation behind.

2.2.5 Insulation

The panel will consist of 2 3/4" thick 3.0-3.5 LB/CFT density fiberglass insulation with tough acrylic primer coating on the side facing air stream and suitable for erosion resistant up to 6000 fpm velocity. The thermal conductance of the insulation shall be less than 0.07 BTU/hr./sqft. at 50 degree F mean temperature. The overall thermal conductance of the assembled structure shall not exceed 0.14 BTU/hr/sq.ft at 50 Deg F Mean temperature.

2.2.7 Doors

Hinged access doors shall be wide enough to allow easy access for service maintenance and minimum of 18" wide. The door, frame & outer skin shall be of minimum 18 Gauge galvaneal steel whereas inner skin shall be 22g Solid Liner with stainless steel Piano hinges and a minimum of two (2) Vent lock VL-310 Handles, the door gasket shall be of bulb type. Access doors shall be placed at locations as shown in the drawing and shall have viewing windows 8X8 or 10"x10". The doors will open inward or outward according to positive or negative pressure in the respective sections.

Each Access Section shall have 100 Watt, 120/1/60 Hz marine lights comprising vapor tight, fully enclosed, gasket and rugged fixture for surface mounting in location exposed to moisture and corrosive fumes. The exposed metal parts shall of weatherproof, corrosion resistant surface hardened die cast aluminum. The lights will be wired to individual switch in a box located at exterior of the unit near door and covered with Toggle Switch Cover.

2.2.8 Coil Racks, Drain & Drip Pans.

1. Drain pan shall be made out of 16 G Stainless Steel S/S 304 2B Finish material, continuously welded and positively sloped for drain on side as shown on the drawing with 1 1/2"-2" NPT drain connection with a minimum depth of 2.5" at drain. Drain piping shall be 304 stainless steel with each drip pan individually piped to the drain pan.



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

2. For ease of removal the coil shall be supported on individual racks. The racks shall be made of Structural steel channel. One side of the coil shall have a removable panel for coil pull out and removal and shall be designed to permit the removal of individual coil sections without disturbing remaining coils.

2.2.9

The inner skin at coil, drain pan section, humidifier section shall be 22G solid Hot Dip Galvanized Steel Sheet in accordance with ASTM-653, Commercial quality, G90 coating equivalent to Z275 measured in accordance with Triple Spot Test Method.

2.2.10 Paints

The exterior of the indoor unit shall be cleaned and painted with high gloss star dry 360 series Alkyd enamel paint.

The exterior of the outdoor unit shall be cleaned and primed with two component chemical & corrosion resistant high impact Anticorrosive Epoxy/Polyamide Primer consisting of Starpoxy 430P base and Starpoxy 430 C Catalyst. The well primed surface shall be applied with chemical and whether resistant two components Acrylic Aliphatic Polyurethane Top Coat Starthane 560 coatings consisting of Starthane 560 Base & Catalyst and capable of withstanding 5% salt spray on treated aluminum substrate for 3000 hours in accordance with ASTM B117.

2.2.11 Magnehelic Filter Gauge

A differential Pressure Gauge for measuring the pressure drop across each filter bank shall be provided. The gauge shall be diaphragm-actuated dial type series 2000, 3 7/8" dia. white dial with black figures & graduations, 0 to 1" water gauge operating ranges and will have two static pressure taps and vent valves. Static Pressure taps shall be factory piped.

2.2.12 Louver

Provide unit-mounted louvers, factory painted to match unit with built in rain lip and bird screen. Louver frame and blades shall be of aluminum alloy construction. Free area shall be 52% and maximum pressure drop at rated flow shall be a maximum of 0.12" WG. Water penetration shall be 0.01 oz / sq. ft. at 827 fpm face velocity.

2.2.13 Filters

- (1) Filters shall be 2" deep, medium efficiency, pleated, disposable type. Each filter shall consist of non-woven cotton and synthetic fabric media, media support grid and enclosing frame. The filter shall be listed by Underwriters' Laboratories as Class 2.

EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

- (2) Filter media shall have an average efficiency of 25-30% on ASHRAE Test Standard 52-76. It shall have an average arrestance of 90-92% in accordance with the test standard.
- (3) The effective filter media shall not be less than 4.6Ft² of media per 1.0ft² of filter face area and shall contain not less than 15 pleats per linear ft.
- (4) Holding frames shall be face loading type, 16Ga galvanized steel and shall be equipped with gaskets and four spring type positive fasteners.
- (5) Filters shall be equal to Farr 30/30 with type 8 holding frames and springs.

2.2.14 Cooling & Hot Water Coils with Plumbing

1. Provide removable coils per ARI 410 with access to both sides. Coils shall be provided as an integral part of the unit construction and shall be attached to, and supported by the unit framework. Coil capacities shall be as indicated on the schedule.
2. Coils shall be constructed with 5/8" OD copper tubes with 0.020" wall thickness. Fins shall be 0.0065" Aluminum. Coil casing shall be galvanized steel for heating applications and 304 stainless steel for cooling applications. Headers shall be copper with red bronze pipe connection.

OPTION

All coils shall have factory packaged valves consisting of 3-way mixing valve with actuator, ball type isolating valves, supply and return temperature gauges, pressure gauge with the ability to read individual supply and return pressure and also read pressure differential. The Valve package shall be enclosed in a cabinet with not more than 15" deep from outside AHU Wall. The cabinet will be 2" thick and insulated with the same insulation as AHU Wall. The cabinet will have hinged door and all the knobs, gauges and handles will face the door for ease of access and operation. Coil connections shall be extended thru the casing wall. The cabinet shall be factory pressure tested and shipped loose for site installation.

2.2.15 Dampers

Provide unit with factory mounted outside, relief and return air dampers (where shown in the plan) of galvanized steel blades, with metallic bulb edge seals (vinyl edge seal is not acceptable) in galvanized frame, in opposed blade arrangement with non-slip keyed connecting rods and linkages.



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

Permanently secure damper blades on a single shaft with self-lubricating nylon bearings. Position damper blades across short air opening dimension. Maximum leakage shall not exceed 2 percent at 4 inch water gauge differential pressure when sized for 2000 fpm face velocity.

2.2.16 Fans

The fan shall be centrifugal plenum type designed without a scroll housing incorporating a non-overloading type backward inclined airfoil blades continuously welded around all edges to a wheel shroud and heavy gauge reinforced steel back plate. The assembly shall have structural steel frame. The fan shall have inlet plate incorporating removable spun inlet cone designed for smooth airflow into the accompanying inlet retaining ring of the fan wheel.

All wheels shall be statically and dynamically balanced on precision electronic balancer to a level of G6.3 (Per ANSI 2-19 or better).

All shafts shall be solid steel accurately turned, ground, polished and ring gauged for accuracy. Shaft shall have first critical speed at least 1.35 times the maximum speed of the fan.

All fans shall have heavy duty, grease lubricated, anti friction ball or roller bearing, self aligning, pillow block type bearing selected for minimum average life ABMA L50 of 200,000 hrs and fitted with re-greasable fittings with option of extending the lube lines for easy re-lubrication.

Each fan component shall be thoroughly degreased before application of rust-preventive blue primer. After complete assembly, a finished coat shall be applied to the assembly.

Fan performance shall be based on test conducted in accordance with AMCA standard test code for air moving devices and shall be licensed to bear AMCA seal. Drives shall be V-belt and sized for 1.5 times the fan motor horsepower. The fan shall have an OSHA belt guard.

2.2.17 Inlet Flow Optimizer

The inlet flow optimizer to the plenum fan shall be acoustically and aerodynamically treated to give better airflow conditions across the coils and filters. The acoustical treatment shall be designed specifically to reduce the noise at the inlet of the fans. The acoustical inlet shall have aerodynamic shape with 20 gauge perforated galvanized sheet with 1/2" thick acoustical media with a mat faced insulation and carefully packed fiberglass acoustical insulation to provide absorptive insertion loss.



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

2.2.18 CFM Readout.

The unit manufacturer shall provide a volume measuring device, using multiple pressure sensors located at the fan inlet flow concentrator giving 0-2" wg pressure signals to a pressure transmitter that in turn will supply 4-20 amp electrical signal to a digital readout with square root extractor to display real time air flow. The readout shall be factory calibrated with actual air flow measurement using Pitot tube or traverse tube.

Part-3 Vibration Analysis

Each Fan shall be operated at design RPM and vibration measurements made in all three axes at each bearing location. Vibration on fans shall not exceed the following in any axis:

Fan RPM (peak to peak)	Mils
500	x
800	x
1200	x
1800	x
2000 or greater	x

Part -4 Casing leakage

Tests shall verify that casing leakage for air unit is less than 1% of design airflow when tested at 1.5 times fan shut off pressure. Determine leakage using the testing methods as described in SMACNA HVAC Air Duct Leakage Test Manual. Provide temporary sealing of openings as required for leakage testing.

Part-5 Electrical Tests

Energize and run test for not less than ½ hr all electrical components to prove satisfactory operation, and that all circuits are free from short circuits and unspecified ground. Each Variable speed drive unit shall be completely functionally tested under actual motor load. Test that the insulation resistance to ground of all non-grounded circuits is not less than one meg ohms at 1000 volts DC. Arrange to have units factory inspected and perform other testing as required to obtain ETL Label.

Part –6 Installation of Air Handling Units

1. General: Install air handling units where indicated on the contract drawings, in accordance with equipment manufacturer's published installation instructions.

EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

2. Access: Provide access space around the air handling units for service as indicated on the drawings but not less than that recommended by the manufacturer.
3. Field Adjustments: Adjust fan vibration isolators in accordance with manufacturer's instructions.
4. Duct Connections: Provide ductwork, accessories, flex connection as indicated on the drawing.

Part-7 Testing & Commissioning

Unit manufacturer shall provide the services of a trained technician to supervise the installation of the unit and to perform the start up of the unit. After the unit is installed, perform inspection, start-up and checkout of the equipment. Do not start up equipment until the following operations are complete:

1. Confirm shipping bracket and bracing is removed.
2. Confirm unit components are secured on mountings and supporting devices and verify that connections for electrical and piping are complete. Verify proper thermal overload protection is installed in motors, starters and disconnects.
3. Inspect and confirm satisfactory completion of all field joints.
4. Verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
5. Lubricate bearings, pulleys, belts and other moving parts with factory recommended lubricants.
6. Verify manual and automatic volume control in connected duct work systems are in the full open positions.

OPTIONAL TEST (NOT PART OF THE MAIN SCOPE)

Part-8 Aerodynamic Performance Test

The flow through the unit shall be measured by means of survey over discharge and inlet. A calibrated hot wire anemometer shall be used for velocity measurement across the discharge and inlet sections. The inlet of the unit shall be covered with steel net and filter to simulate the system load. The static pressure rise across the fan shall be measured by means of calibrated by total and static pressure probe traverse at inlet and at discharge of fan.



EB AIR CONTROL, AIR HANDLING UNIT SPECIFICATION

The alternative procedure for measuring flow velocity across the coils or filters can be a face traverse as per ASHRAE TP 3359 using a rotating vane anemometer measuring velocity reading on downstream side of a coil or filter. Airflow shall be within 5% of design.

Part-9 Acoustical Tests:

The acoustical tests shall be on the basis of sound power measurement. The sound power test shall be in accordance with sound intensity method as specified in ANSI standard S 2.12 "Engineering Method for the Determination of Sound Power Levels and Noise Sources using Sound Intensity" and in ISO Standard 9614-1, "Acoustics Determination of Sound Power Level of Noise Sources using Sound Intensity". The sound power level shall not exceed the specified limit.

End of Section