Section 23 73 13
FACTORY ASSEMBLED AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work of this section shall include, but is not limited to the following:
   1. Centrifugal Fan Draw-Through Units
   2. Centrifugal Fan Blow-Through Units
   3. Axial Fan Draw-Through Units
   4. Axial Fan Blow-Through Units
   5. Mixed Flow Fan Blow-Through Units

1.2 RELATED DOCUMENTS

A. Section 23 05 01 - Mechanical General Provisions

B. Section 23 05 13 - Electric Motors

C. Section 23 05 14 - Variable Frequency Drives

D. Section 23 05 48 - Vibration Isolation and Seismic Restraints

E. Section 23 05 93 - Mechanical Systems Balancing

F. Section 23 07 00 - HVAC Duct, Piping, Equipment and Breeching Insulation

G. Section 23 09 00 - Building Management System (BMS)

H. Section 23 09 93 - Automatic Control Sequences

I. Section 23 31 00 - Ductwork

J. Section 23 33 13 - Dampers

K. Section 23 33 19 - Acoustics

L. Section 23 34 00 - Fans

M. Section 23 40 00 - Air Filters and Cleaners

N. Section 23 82 16 - Hydronic Cooling and Heating Coils

1.3 SUBMITTALS

A. Manufacturer's Data: Submit certified dimensioned drawings, including total weight and support points. See Section 23 05 01 for additional submittal requirements.

B. Product Data: Submit fan curves, coil performance and acoustical data for each unit, air pressure drops across each section. **Submit fan curve showing performance.**

C. Construction Details: Access doors, drain pans, casing, frame, component mounting arrangements and brackets, connection details, hardware.

D. Refer to each section listed above in 1.02 - Related Documents for additional submittal requirements.

1.4 QUALITY ASSURANCE

A. Construct units in compliance with all requirements of the latest edition of the AMCA certified rating standards for air moving equipment: Air and Sound.

B. Test, rate and certify units' performance and characteristics, including cooling and heating coils, in

accordance with ARI.

C. The **[Owner and Architect] [Owner's Representative]** may observe the air-handling units for this Project under manufacture at the factory prior to shipment, if they so desire. The Contractor shall notify the **[Owner and Architect] [Owner's Representative]** in writing of the production schedule and shipment date at least three (3) weeks prior to the first air-handling unit production date.

D. Provide UL or ETL listed electric heating coils.

E. Sound Ratings: Construct each air-handling unit to operate for all conditions of the air flow (including units serving variable air volume systems from 100 to 15 percent air flow) for installation and sound quality environment as specified in Specification Section 23 33 19 - Acoustics. Achieve sound rating required for the completed installation with the air-handling unit designed, constructed and installed to comply with the sound power level listed hereinafter with the room construction as indicated on the Architectural and Structural Drawings for this Project, and with the ductwork and vibration isolation Specifications and as indicated on the Mechanical Drawings and in these Specifications.

F. In order to establish centrifugal fan test curves, test each type of unit in accordance with ARI Standard 430-66.

G. Maximum allowable air leakage shall be **1.4**percent of design airflow at **1.5 times scheduled** static pressure for the air-handling unit as installed.

PART 2 - **PRODUCTS**

2.1 GENERAL

A. Provide factory-built air-handling units of the horizontal or vertical type with the **components, arrangement,** performance requirements and capacities as scheduled and as detailed on the Drawings. Air-handling unit types, as designated on the Drawings, are as follows:
   1. EC Direct Driven Draw Through

B. Construct each air-handling unit complete with base rails, casings, fans, internal spring type vibration isolation, seismic restraints, insulation, drain pans, heating coils, cooling coils, access doors, lights, economizers, humidifiers, moisture eliminators, air blenders, filters, galvanized or painted filter retainer frames or plenums for filter holding frames and media, control dampers, factory mounted fan motors.Coordinate the power and torque requirements of automatic dampers, inlet vanes, inlet cones, inlet plugs, etc., and other data necessary, with the BMS contractor for the proper selection and coordination of the electric or pneumatic actuators.

2.2 ACCEPTABLE MANUFACTURERS

A. Air-Handling Units: Temtrol, Trane, Pace, York, Air Systems, Dunham Bush, Aaon.

B. Fan Wheels and Housings, Dampers, Hydronic Coils, Vibration Isolation, Seismic Restraints, Filters, Gauges, Motors, Hardware: Refer to each individual specification section listed above in 1.02 - Related Documents.

2.3 UNIT CASINGS

A. Construct each unit with an airtight sectionalized casing of **"lock forming" quality galvanized G-90 painted galvanized** steel. For maximum rigidity properly reinforce casing and brace with steel angle framework with the same finish as the unit casing.

B. Provide suitable continuous gaskets at all joints between casing sections. Provide stiffeners, if required, to prevent unit casing pulsation or oil canning. Each section shall be modular with identical height, width, and continuous pre-punched matching mating flanges.

C. Completely enclose all connections, coil headers, and return bends in coil section. Do not use coil frames as structural members of the coil section. Construct the coil section in such a manner that the coils can be easily removed without affecting the structural integrity of the casing.

D. Extend the drain pans under the complete coil and humidifier sections including access and plenum sections between multiple coils. **Pan shall extend minimum 15 inches downstream and 9 inches upstream beyond face of coil and be minimum 2 inches deep.** Pan shall be rigid and watertight with threaded pipe drain connection **extended out the side of the unit**. **Slope pan minimum 0.25 inches per foot in two directions.** Provide drain pans of the double pan insulated type, with a stainless steel inner pan and a galvanized or painted outer pan. Provide UL listed insulation 2-inch thick high-density fiberglass, cemented and vapor sealed between the inner and outer pan, or ½ inch thick foamed-in-place closed cell insulation.

E. Furnish access doors, **minimum 18 inches wide by 72 inches high where possible** in size, to allow access to all sections. Provide inspection windows in each fan section access door. **Window shall have double paned tempered glass with an integral desiccant between the hermetically sealed panes.** Equip all doors whose smallest dimensions are twelve inches or less with Amerloc Style 10 or Ventlok Style 100 latch; equip all other doors with Ventlok Style (or equal) latch and Ventlok Style (or equal) hinges. Locate doors so that the unit may be inspected or entered regardless of mounting arrangement. **Doors shall open against fan pressure or doors shall be provided with a safety latch.** Separate door insulation from unit insulation and secure and seal as specified for unit casing insulation. **Interior liner of access doors shall be non-perforated.** Locate access doors on the most accessible side of the air-handling unit as it is installed on this Project. Provide continuous full height piano hinge for each fan section access door. Fan section door width shall permit removal of fan motor.

F. Internally insulate unit casings with minimum **2**-inch thick,**3**-pound density fiberglass or foam with an inner roof and walls of perforated galvanized steel. Floors shall be double wall non-perforated galvanized steel. Cover all exposed parts such as angles, braces, etc., in contact with exterior surfaces with insulation in such a manner to prevent condensation on any surface. Install insulation in such a manner as not to be disturbed if panels are removed. Secure insulation to the casing surfaces and framework with adhesive over entire surface and stik-clips, grip nails or weld pins with fasteners. Protect the insulation from delaminating or fretting by coating edges with adhesive or mastic. Exposed fiberglass shall not be allowed. **Insulation shall meet the erosion requirements of UL 181 facing the air stream. Refer to Section 23 07 00 for additional requirements**

2.4 FAN, SHAFT AND DRIVE ASSEMBLIES

A. Provide **single inlet, multi-blade, un-housed plug type** centrifugal fans with **airfoil**blades as indicated in the schedule by model or type of fan.

B. Factory assemble fans, sheaves, motors and belts on or within the fan section casing. Supply balanced fans, motors and sheaves. After the factory assembly of the fan, motor and drive, balance air-handling unit fans, bearings and sheaves to **meet AMCA Standard 204-96Fan base shall be spring isolated with separate seismic snubbers and attached to the casing structural frame. EC Fans alternately shall be mounted to the fan wall using neoprene vibration isolators.** Units shipped without motors and drives completely assembled shall not be acceptable.

C. Provide variable frequency drives and matching motors as specified in Section 23 05 14 - Variable Frequency Drives and Section 23 05 13 - Electric Motors. **No splices are allowed between VFD and fan motor.**

D. Provide Direct Driven EC Fans with matching motors.

E. Motors shall be selected so that they will not overload if the static pressure drops one-quarter inch below the specified value. Motors shall be mounted on the coil connection side unless indicated

otherwise on the Drawings. Each motor shall be factory mounted on an adjustable base rigidly supported on the fan base frame. Refer to Section 23 05 13 - Electric Motors and Section 23 34 00 - Fans.

2.5 HYDRONIC COILS

A. Locate supply and return connections on the same end of the coil.

B. Provide 16-gauge **galvanized** steel casings with intermediate stiffeners if over 60 inches in length.

C. Provide manual air vent connections except on those return connections where the coil header piping is designed to be self-venting. Furnish coils with manual drain connection extended outside the unit casing.

D. Install heating coils in the reheat position except in outside air preheating units which will be in the preheat position.

E. Refer to Section 23 82 16 - Hydronic Cooling and Heating Coils.

2.6 FILTER SECTION

A. Provide galvanized or painted steel filter sections and retainer frames for Type “B” filters, or plenums for filter-holding frames for Type “A” filters, to accommodate the specified or scheduled air filter media at maximum filter face velocity of 500 feet per minute.

B. Refer to Drawings and Section 23 40 00 - Air Filters and Cleaners.

C. Maximum length of filter section casing shall be 30 inches for bag filters and 16 inches for flat filters.

D. Units will be furnished with 2” MERV8 filters and 4” minimum MERV13 filters.

E. Spare and replacement construction filters will be provided by the mechanical contractor.

2.7 VIBRATION ISOLATION AND SEISMIC RESTRAINTS

A. Refer to Drawings and Specification Section 23 05 48 - Vibration Isolation and Seismic Restraints. Provide seismic calculations for internally isolated fans.

2.8 DAMPERS

A. Provide supply, return, exhaust, outside air, minimum outside air and bypass or zone dampers, as required.

B. Refer to Section 23 09 00 - Building Management System (BMS) and Section 23 09 93 - Automatic Control Sequences.

PART 3 - **EXECUTION**

3.1 Provide continuous 10-gauge galvanized steel base rail for entire length of each side of all air-handling units with intermediate cross members as required.

3.2 PROVIDE VAPOR PROOF 120 VOLT LIGHT FIXTURE, STEEL GUARD AND LAMP INSIDE EACH FAN SECTION AND BLANK ACCESS SECTIONS WIRED TO EXTERNAL SWITCH NEXT TO ACCESS DOOR.

3.3 ALL MATING FLANGES SHALL BOLT TOGETHER WITH BOLT HOLES SPACED A MAXIMUM OF 10 INCHES. ALL MATING FLANGES SHALL BE GASKETED AND EXTEND AROUND FULL PERIMETER OF EACH CASING SECTION.

3.4 PROVIDE FLEXIBLE CONNECTION FOR ALL FANS AND EXTERNAL DUCT CONNECTIONS.

SUPPORT CONNECTING DUCTWORK OR SOUND ATTENUATORS INDEPENDENT OF THE AIR-HANDLING UNIT. REFER TO SECTION 23 31 00 - DUCTWORK.

3.5 PROVIDE AIR TIGHT GROMMETS FOR ALL CASING PENETRATIONS SUCH AS COIL CONNECTIONS, ELECTRICAL CONDUIT FOR POWER AND CONTROL WIRING, CONTROL AIR TUBING, GREASE TUBING, ETC. EXTEND ALL SUCH CONNECTIONS FROM INSIDE THE AIR-HANDLING UNIT TO AN ACCESSIBLE LOCATION.

3.6 COORDINATE DAMPER SIZES WITH MECHANICAL CONTRACTOR.

3.7 PROVIDE ADDITIONAL BLANK ACCESS SECTIONS AS REQUIRED TO COORDINATE SUPPLY, RETURN, EXHAUST AND OUTSIDE AIR DUCT CONNECTIONS LOCATIONS WITH DUCTWORK SHOP DRAWINGS SUBMITTALS.

END OF SECTION

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