SECTION 237313 - INDOOR CENTRAL STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes air-handling units with coils for indoor installations.

1.2 SUBMITTALS
   A. Product Data: For each type of indoor air-handling unit indicated. Include the following:
      1. Dimensions, weights, required clearances, location and size of each field connection.
      2. Certified fan-performance curves with system operating conditions indicated.
      3. Certified fan-sound power ratings.
      4. Certified coil-performance ratings with system operating conditions indicated.
      5. Motor ratings and electrical requirements.
      6. Material gages and finishes.
      7. Dampers, including housings, linkages, and operators.
      8. Accessories.

   B. Operation and maintenance data.

1.3 QUALITY ASSURANCE
   A. NFPA Compliance: Indoor air-handling units and components shall be designed, fabricated, and installed in compliance with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

   B. ARI Certification: Indoor air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air- Handling Units," and shall be listed and labeled by ARI.

   C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Air Enterprises, Inc.
   2. Airtherm, a Mestek company.
   4. Carrier; Div. of United Technologies Corp.
   5. CES Group Inc.; Governair, Mammoth, Temtrol, Venmar Ventrol, Webco Divisions.
2.2 MANUFACTURED UNITS

A. Indoor air-handling units shall be factory assembled and consist of fans, motor and drive assembly, coils, plenums, filters, condensate pans, dampers, control devices, and accessories.

2.3 CABINET

A. Materials: Formed and reinforced single-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
   1. Outside Casing: Galvanized steel, minimum 18 gage thick.
   2. Inside Casing: Galvanized steel, minimum 20 gage thick.
   3. Floor Plate: Galvanized steel, 0.1382 inch thick.
   4. Base Rails or Legs: Galvanized steel.

B. Cabinet Insulation: Comply with NFPA 90A or NFPA 90B.
   1. Materials: ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers.
   2. Thickness: 1 inch on single-wall units, 2 inch on double-wall units.
   3. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
   5. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C 916.
   6. Mechanical Fasteners (Single-Wall Units): Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to panels without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
   7. Location and Application (Single-Wall Units): Factory applied with adhesive and mechanical fasteners to the internal surface of panels in all sections.

C. Access Doors: Double-wall construction of same materials and finishes as cabinet, complete with hinges, latches, handles, and gaskets. Access doors shall be sized and located to allow periodic maintenance and inspections. Provide door handles on both sides of doors where required by OSHA for confined space access. Provide access doors in the following locations:
   1. Fan Section.
   2. Access Section.

D. Condensate Drain Pans: Formed sections of stainless-steel sheet complying with requirements in ASHRAE 62. Fabricate pans with slopes in two planes to collect condensate from cooling
coils (including coil piping connections and return bends) [and humidifiers] when units are operating at maximum catalogued face velocity across cooling coil.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: One end of pan, same side as coil connections.
3. Units with stacked coils shall have an intermediate drain pan or drain trough to collect condensate from top coil. Provide drop tube(s) to guide condensate to the main drain pan.
4. Drain pans shall extend a sufficient distance downstream of coils [and humidifiers] to contain moisture carryover.

2.4 FAN SECTION

A. Fan-Section Construction: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure and equipped with formed-steel channel base for integral mounting of fan, motor, and casing panels. Mount fan and motor on a common structural steel base.

B. Centrifugal Fan Housings: Formed- and reinforced galvanized-steel panels to make curved scroll housings with shaped cutoff, and spun-metal inlet bell.
   1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, and accessories.
   2. Performance Class: AMCA 99-2408, Class I.
   3. Plenum Fans: On units with plenum fans fabricate without fan scroll and volute housing.

C. Fan Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower.

D. Forward-Curved Fan Wheels: Galvanized-steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow and mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

E. Backward-Inclined Fan Wheels: Steel construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

F. Airfoil Fan Wheels: Steel construction with curved inlet flange, backplate, airfoil blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

G. Coatings: [Alkyd enamel or baked-on powder coating][Thermoplastic vinyl] [Epoxy] [Synthetic resin] [Phenolic] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel] <Insert manufacturer's name; trade name>.

H. Shafts: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

I. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing. Provide lubrication lines extended to drive side of fan. Exception: Bearings on forward-curved fans may be permanently lubricated.

1. Ball-Bearing Rating Life: ABMA 9, L_{10} of 200,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, L_{10} of 200,000 hours.

J. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation and with 1.5 service factor based on fan motor.

1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. Belts: Oil resistant, nonsparking, and nonstatic; matched for multiple belt drives.

K. Vibration Control:

1. Install fan/motor assembly on open-spring vibration isolators having a minimum of 1-inch static deflection and side snubbers.
2. Provide flexible connector between fan housing and cabinet.

L. Fan-Section Source Quality Control:

2. Factory test fan performance for flow rate, pressure, power, air density, rotation speed, and efficiency. Establish ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

2.5 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment".

2.6 COILS

A. Coil Sections: Common or individual, insulated, coil section for heating and cooling coils. Design and construct to facilitate removal and replacement of coil for maintenance and to ensure full airflow through coils.

B. Water Coils: Drainable coil fabricated according to ARI 410.
1. Piping Connections: On same end.
2. Tubes: Copper, complying with ASTM B75, 0.500 or 0.625 inch outside diameter.
3. Fins: Aluminum, maximum 144 fins per foot.
5. Headers: Cast iron with drain and air vent tappings or seamless copper tube with brazed joints, prime coated.
6. Frames: Galvanized-steel channel frame.
7. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410 for working pressure of 200 psig at 200 degrees F.
8. Source Quality Control: Test to 300 psig and to 200 psig underwater.

C. Refrigerant Coils: Coil designed for use with R-22 refrigerant, fabricated according to ARI 410, connected with brazed fittings.

2. Tubes: Copper, complying with ASTM B75, 0.500 or 0.625 inch outside diameter.
3. Fins: Aluminum, maximum 144 fins per foot.
5. Suction and Distributor: Seamless copper tube with brazed joints.
6. Frames: Galvanized-steel channel frame.
7. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410 for working pressure of 300 psig.
8. Source Quality Control: Test to 450 psig and to 300 psig underwater.


2. Open Coil: Helix-wound resistance wire of 80 percent nickel and 20 percent chromium supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Watt density shall not exceed 35 watts per square inch of wire surface area.
3. Finned Tubular: Coiled resistance wire of 80 percent nickel and 20 percent chromium surrounded by compacted magnesium-oxide powder in tubular-steel sheath; with spiral-wound, copper-plated, steel fins continuously brazed to sheath.
4. Overtemperature Protection: Disk-type, automatically resetting, thermal-cutout, safety device; serviceable through terminal box without removing heater from unit. Provide secondary protection consisting of load-carrying, manually resetting or manually replaceable, thermal cutouts; factory wired in series with each heater stage.
5. Control Panel: Mounted on exterior of cabinet with disconnecting means and overcurrent protection. Include the following controls:
   c. SCR controller.

2.7 DAMPERS

A. General: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. Damper Operators: Electric specified in Division 15 Section "HVAC Control System."
C. Mixing Boxes: Parallel-blade galvanized-steel dampers mechanically fastened to steel operating rod in reinforced, galvanized-steel cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

D. Combination Filter and Mixing Box: Parallel-blade galvanized-steel dampers mechanically fastened to steel operating rod in reinforced, galvanized-steel cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously. Cabinet support members shall hold 2-inch-thick filters. Provide hinged access panels or doors to allow removal of filters from both sides of unit.

E. Zone Dampers: Two single-blade galvanized-steel dampers offset 90 degrees from each other on steel operating rod rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame. Break-form damper blades, provide gaskets and edge seals, and mechanically fasten to operating rod.

2.8 FILTER SECTION

A. Filter Section: Provide filter holding frames arranged for flat or angular orientation, with access door on drive side of unit. Filters shall be removable from one side. Refer to Drawings for filter efficiency and type.

2.9 ELECTRICAL ACCESSORIES

A. Power Center:

1. Provide single power connection point to unit complete with fused disconnect, transformer sized to power 120 VAC accessories and unit mounted controllers.
2. Fan motors shall be wired to individual disconnects within or outside the fan section.
3. Provide fused disconnect for 120 VAC transformer.

B. Variable Frequency Drive: Provide VFD for each motor indicated.

C. Lights: Provide 100-watt, vapor-proof, marine-type service lights in each section provided with an access door. Space lights at a maximum of 15 feet on center within each lighted section. All lights shall be wired to a single toggle switch, centrally mounted on the exterior of the unit.

D. Convenience Outlets: Mount a 15 amp, duplex, weather proof, GFCI outlet on the exterior of the unit adjacent to the light switch. [On units over 50 feet long, provide additional outlets at 25 feet on center.]

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install indoor air-handling units as follows:

1. Floor-Mounted Units: Support on 4-inch-high concrete bases using neoprene pads as specified in Division 15 Section “Vibration [and Seismic] Controls for HVAC Piping and Equipment.” Secure units to anchor bolts installed in concrete bases. See Division 15
Section “Common Work Results for HVAC” for concrete materials and fabrication requirements.

2. Suspended Units: Suspend units from structural-steel support frame using threaded steel rods and spring hangers.

B. Arrange installation of units to provide access space around indoor air-handling units for service and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect condensate drain pans using copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

D. Hot- and Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Connect to supply and return coil tappings with shutoff or balancing valve and union or flange at each connection.

E. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Connect to supply and return coil tappings with shutoff valve and union or flange at each connection.

F. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections.

G. Electrical: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

H. Ground equipment according to Division 26.

3.3 QUALITY CONTROL

A. Complete the manufacturer’s installation and startup checklists and resolve all discrepancies.

B. Provide the Commission Agent and SRP PM with the completed checklists/test results.

3.4 TRAINING

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain units.

END OF SECTION