SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Baseboard radiation.

B. Finned tube radiation.

C. Convectors.

D. Unit heaters.

E. Cabinet unit heaters.

F. Fan-coil units.

G. Unit ventilators.

H. Blower-coil units.

1.02 RELATED REQUIREMENTS

A. Section 22 0513 - Common Motor Requirements for Plumbing Equipment.

B. Section 22 0716 - Plumbing Equipment Insulation.

C. Section 22 0719 - Plumbing Piping Insulation.

D. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

E. Section 23 0716 - HVAC Equipment Insulation.

F. Section 23 0719 - HVAC Piping Insulation.

G. Section 23 0913 - Instrumentation and Control Devices for HVAC.

H. Section 23 0993 - Sequence of Operations for HVAC Controls.

I. Section 23 2113 - Hydronic Piping.

J. Section 23 2114 - Hydronic Specialties.

K. Section 23 2213 - Steam and Condensate Heating Piping.

L. Section 23 2214 - Steam and Condensate Heating Specialties.

M. Section 23 2300 - Refrigerant Piping.

N. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.03 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. AHRI 350 - Sound Performance Rating of Non-Ducted Indoor Air-Conditioning Equipment; 2008.

C. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).

D. AHRI 440 - Performance Rating of Room Fan-Coil Units; 2008.

E. AHRI 840 - Unit Ventilators; 1998.

F. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

G. ASHRAE Std 62.1 - Laboratory Method of Testing to Determine the Sound Power in a Duct; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

K. UL 674 - Electrical Motors and Generators for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
   3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   4. Submit the following for blower-coil units indicating:
      a. Overall dimensions including installation, operation, and service clearances.
      b. Lift points, recommendations, and center of gravity.
      c. Unit shopping, installation, and operating weights including dimensions.
      d. Fan curves with specified operating point clearly plotted.
      e. Safety and start-up instructions.
   5. Indicate mechanical and electrical service locations and requirements.

D. Certificates: Certify that coils are tested and rated in accordance with AHRI 410.

E. Manufacturer's Instructions: Indicate installation instructions and recommendations.

F. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

H. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 5 year manufacturer's warranty for _____.

PART 2 PRODUCTS

2.01 SEE SECTION 01 6000 FOR ADDITIONAL REQUIREMENTS.

2.02 HYDRONIC BASEBOARD RADIATION

A. Manufacturers:
   1. Haydon Corporation; _____: www.haydoncorp.com.
   2. Slant/Fin Corporation; _____: www.slantfin.com.
   3. Sterling Hydronics, a Mestek Company; _____: www.sterlingheat.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Perform factory run test under normal operating conditions, water, and steam flow rates.

C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum or aluminum/copper fins.

D. Enclosure:
   1. Steel material with high back and top, of one piece construction.
   2. Removable front panel, end panel, end caps, corners, and joiner pieces.
   3. Full length control damper.
   4. Provisions for return piping.

E. Finish:
   1. Factory applied, baked enamel finish.
   2. Color: As selected from color chart.

F. Element Brackets: Galvanized or pre-painted steel supported from panel with non-metal element cradles or shoes, that allow for noise free expansion and contraction.

2.03 HYDRONIC FINNED TUBE RADIATION

A. Manufacturers:
   1. Modine Manufacturing Company; _____: www.modineHVAC.com.
   2. Slant/Fin Corporation; _____: www.slantfin.com.
   3. Zehnder Rittling; _____: www.rittling.com.

B. Required Directory Listing: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

C. Heating Elements: 1 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 by 4 inches, suitable for soldered fittings.

D. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

E. Enclosures: 18 gage, 0.0478 inch sheet steel up to 18 inches in height, 16 gage, 0.0598 inch sheet steel over 18 inches in height or aluminum as detailed, with easily jointed components for wall to wall installation.
   1. Support rigidly, on wall or floor mounted brackets.

F. Finish: Factory applied baked primer coat.

G. Damper: Where not thermostatically controlled, provide knob-operated internal damper at enclosure air outlet.

H. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 by 7 inch minimum size, integral with cabinet.

2.04 HYDRONIC UNIT HEATERS

A. Manufacturers:
   1. Modine Manufacturing Company; _____: www.modineHVAC.com.
   2. Sterling Hydronics, a Mestek Company; _____: www.sterlingheat.com.
   3. Trane, a brand of Ingersoll Rand; _____: www.trane.com.

B. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Perform factory run test under normal operating conditions, water, and steam flow rates.

D. Casing: Minimum 18 gage, 0.0478 inch thick sheet steel casing with threaded pipe connections for hanger rods for horizontal models and minimum 18 gage, 0.0478 inch thick sheet steel top and bottom plates for vertical projection models.

E. Finish: Factory applied baked primer coat.

F. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

G. Air Outlet: Adjustable pattern diffuser on vertical projection models and two, four, or ____ way louvers on horizontal projection models.

H. Totally Enclosed Motors: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 22 0513.

I. Control: Local solid state disconnect switch.

J. Electrical Characteristics:
   1. ____ hp.
   2. ____ volts, single phase, 60 Hz.

2.05 HYDRONIC CABINET UNIT HEATERS

A. Manufacturers:
   1. Modine Manufacturing Company; _____: www.modineHVAC.com.
   2. Sterling Hydronics a Mestek Company; _____: www.sterlingheat.com.
   3. Trane, a brand of Ingersoll Rand; _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Heating Hot Water: Suitable for working temperatures up to a maximum not less than 200 degrees F.

D. Cabinet: Minimum 16 gage, 0.0598 inch thick sheet steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.

E. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

H. Control: Factory wired, solid state, infinite speed control, located in cabinet.

I. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

J. Electrical Characteristics:
   1. ____ W.
   2. ____ volts, single phase, 60 Hz.

2.06 FAN-COIL UNITS

A. Manufacturers:
   1. Vertical Cabinet, Horizontal Exposed, or Horizontal Recessed:
      a. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp; _____: www.commercial.carrier.com.
      b. Daikin Applied; _____: www.daikinapplied.com.
      c. Trane, a brand of Ingersoll Rand; _____: www.trane.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Vertical Stack:
      a. Carrier Corporation; _____: www.commercial.carrier.com.
      b. Daikin Applied; _____: www.daikinapplied.com.
      c. International Environmental Corporation; _____: www.iec-okc.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.

2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
4. Equipment wiring to comply with requirements of NFPA 70.

C. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

D. Coils:
1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
2. Water Coil: Suitable for working temperatures not less than 200 degrees F.
3. Provide drain pan under cooling coil easily removable for cleaning.

E. Vertical Cabinet and Horizontal Exposed Units: Minimum 18 gage, 0.0478 inch thick sheet steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.

F. Horizontal Recessed Units:
1. Provide with a galvanized steel cabinet, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles with minimum 18 gage, 0.0478 inch thick sheet steel bottom panel.

G. Vertical Stack Units:
1. Minimum 18 gage, 0.0478 inch thick sheet steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, aluminum double-deflection discharge grille, panel-type return grille, and _____.
2. Provide maintenance access via return grille.

H. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

I. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

J. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

K. Controls:
1. Provide units with control valves furnished by the fan coil unit manufacturer.
2. Controls Interface:
a. Relay board.
b. 24-volt transformer.
c. Inverting relays for use with standard thermostats and normally open valves.

L. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

M. Electrical Characteristics:
1. ____ W.
2. ____ volts, single phase, 60 Hz.

2.07 UNIT VENTILATORS

A. Manufacturers:
1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.; _____: www.commercial.carrier.com.
2. Daikin Applied; _____: www.daikinapplied.com.
3. Trane, a brand of Ingersoll Rand; _____: www.trane.com.

B. Performance Data and Safety Requirements:
1. Unit capacities certified and tested in accordance with AHRI 840 and AHRI 350.
2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

D. Hydronic Coils:
   1. Copper tubes mechanically expanded or bonded into evenly spaced aluminum fins.
   2. Factory pressure tested, hydrostatically, to not less than 350 psi.
   3. Provide insulated drain pan under chilled water coils, to prevent sweating, with field convertible left or right hand drain connections.

E. Cabinet: 14 gage, 0.0747 inch sheet steel on solid base pan with exposed edges rounded. Provide removable front panels with quick-acting, key-operated cam locks. Provide removable die-cast or fabricated steel discharge grilles. For units having cooling coils, insulate internal parts and surfaces exposed to conditioned air stream with moisture resistant insulation.

F. Cabinet Accessories: Matching steel construction, reinforced, for use with unit ventilators or finned radiation, with steel alignment pins, adjustable kick plates with leveling bolts, shelves and sliding doors with locks as indicated, sinks, bubbler faucets and bowls, corner, end, and wall filler sections as required.

G. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

H. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven, arranged to draw air through coil.

I. Wall Louvers: Anodized aluminum wall intake box and louvers removable from frame with 1/2 inch square mesh galvanized screen in back of louver.

J. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

K. Controls:
   1. Provide units with control valves furnished by the automatic temperature controls manufacturer.
   2. Unit Ventilator Manufacturer's Controls:
      a. Fan speed switch for unit mounting.
      b. Disconnect switch.
      c. Thermostats and controllers.
   3. Controls Interface:
      a. Relay board.
      b. 24-volt transformer.
      c. Contactors for electric heat units.
      d. Changeover sensors and controls for change-over coils.
   4. Provide ASHRAE Cycle I as defined in ASHRAE (HVACA) Handbook - HVAC Applications.

L. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

M. Mixing Dampers: Multi-blade with compressible seal, capable of varying proportion of mixed air from 100 percent room air to 100 percent outside air.

N. Electrical Characteristics:
   1. ____ kW.
   2. ____ volts, single phase, 60 Hz.

2.08 BLOWER-COIL UNITS

A. Manufacturers:
   1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.; _____: www.commercial.carrier.com.
   2. Trane, a brand of Ingersoll Rand; _____: www.trane.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Performance Data and Safety Requirements:
   1. Coils rated and tested in accordance with AHRI 410.

2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
3. Conform to the requirements of NFPA 90A for unit construction, including filters and related equipment, for protection of life and property from fire, smoke, and gases resulting from conditions having manifestations similar to fire.

C. Unit Casing:
1. Fabricate from heavy gage galvanized steel sheet.
2. Insulate inside walls with 1 inch thick, fiberglass insulation for thermal and acoustical control.
3. Provide access panels allowing servicing of coils, drain pan, fan, motor, and drive.
4. Provide knockouts or hanger rod holes at all four corners for suspended units.

D. Air Coils:
1. Aluminum fins mechanically expanded or bonded to copper tubes having standard sweat connections.
a. Water: Manual, automatic or self-venting, designed to a working pressure and temperature of not less than 250 psig and 200 degrees F.

E. Fans: Forward curved, centrifugal blower, dynamically balanced, adjustable speed V-belt drive with fan shaft supported by heavy-duty, permanently sealed ball bearings.

F. Drain Pan: Cleanable, one-piece construction of polymer, galvanized steel, stainless steel, or _____; with drain connection and sloped for positive drainage.

G. Filters: Fully accessible, flat filter rack with throw-away filters.

H. Motors: Single speed with sleeve or ball bearings, 1750 rpm, wired to unit junction box, and mounted on a resilient motor base.

I. Electrical Controls:

J. Electrical Characteristics:

END OF SECTION 23 8200