SECTION 23 8101

TERMINAL HEAT TRANSFER 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. Radiant heaters.

1.02 RELATED REQUIREMENTS

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

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

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2114 - Hydronic Specialties.

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

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

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

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

1.03 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. 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.
   3. Indicate mechanical and electrical service locations and requirements.,

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

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

F. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

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

1.04 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.

1.05 WARRANTY

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

B. Provide five year manufacturers warranty for fan-coil unit.

PART 2 PRODUCTS

2.01 BASEBOARD RADIATION

A. Manufacturers:
   1. Slant/Fin Corporation; Model _____: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc; Model _____: www.sterlingheat.com.
   3. Trane Inc; Model _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Heating Elements: 3/4 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled.

C. Enclosure: Minimum 0.030 inch steel with 7 inch high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, with front panel easily removable. Provide full length damper.

D. Finish: Factory applied baked enamel of color.

E. Element Brackets: 0.0516 inch galvanized steel to support from panel and noise free element cradle.

F. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.02 FINNED TUBE RADIATION

A. Manufacturers:
   1. Slant/Fin Corporation; Model _____: www.slantfin.com.
   2. Marley Engineered Products; Model _____: www.marleymep.com.
   3. Trane Inc; Model _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Heating Elements: 3/4 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 x 4 inches, suitable for soldered fittings.

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

D. Enclosures: 0.0478 inch steel up to 18 inches in height, 0.0598 inch 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.

E. Finish: Factory applied baked enamel of color as selected.

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

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

H. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.03 CONVECTORS

A. Manufacturers:
   1. Slant/Fin Corporation; Model _____: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc; Model _____: www.sterlingheat.com.
   3. Trane Inc; Model _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast iron headers, steel side plates and supports, factory air pressure tested at 100 psi under water, with means of adjusting pitch of element.

C. Cabinet: 0.0598 inch steel front and top, 0.0478 inch steel back and ends; exposed corners rounded; easily secured removable front panels, adequately braced and reinforced for stiffness.

D. Finish: Factory applied baked enamel of color as selected.

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

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

G. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.04 UNIT HEATERS

A. Manufacturers:
   1. Slant/Fin Corporation; Model _____: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc; Model _____: www.sterlingheat.com.
   3. Trane Inc; Model _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

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

C. Casing: 0.0478 inch steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked enamel of color as selected.

E. 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.

F. Air Outlet: Adjustable pattern diffuser on projection models and two way louvers on horizontal throw models.

G. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 23 0513.

H. Control: Local multi-speed disconnect switch.

I. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.05 CABINET UNIT HEATERS

A. Manufacturers:
   1. Slant/Fin Corporation; Model _____: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc; Model _____: www.sterlingheat.com.
   3. Trane Inc; Model _____: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220 degrees F.

C. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet.

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

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

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

G. Control: Multiple speed switch, factory wired, located in cabinet.

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

I. Capacity: As Scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

J. Electrical Characteristics:
   1. Refer to Section 26 2717.

2.06 FAN-COIL UNITS

A. Manufacturers:
   1. Carrier Corporation; Model _____: www.carrier.com.
   2. Daikin Applied; _____: www.daikinapplied.com.
   3. Trane Inc; Model _____: www.trane.com.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 200 psi and 220 degrees F. Provide drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet.

D. Finish: Factory apply baked enamel of color as selected on visible surfaces of enclosure or cabinet.

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

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

G. Control: Multiple speed switch, factory wired, located in cabinet.

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

I. Capacity: As Scheduled, based on 65 degrees F entering air temperature, 180 degree F average water temperature.

J. Electrical Characteristics:
   1. Refer to Section 26 2717.

2.07 UNIT VENTILATORS

A. Manufacturers:
   1. Carrier Corporation; Model _____: www.carrier.com.
   2. Daikin Applied; _____: www.daikinapplied.com.
   3. Trane Inc; Model _____: www.trane.com.

B. Coils: Copper tubes mechanically expanded into evenly spaced aluminum fins tested to operate at 150 psi. Provide drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. Cabinet: 0.0747 inch 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.

D. Finish: Factory apply baked enamel of color as selected on visible surfaces of enclosure or cabinet.

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

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

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

H. Air Cooled Condensing Unit: Corrosion resistant cabinet, with hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection, copper tube aluminum fin condenser coil, direct drive propeller fan with permanently lubricated ball bearing or ECM single phase motor with internal overload protection.

I. Control: Multiple speed switch, factory wired, located in cabinet.

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

K. Heating Capacity: As Scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

L. Electrical Characteristics:
   1. Refer to Section 26 2717.

2.08 HYDRONIC RADIANT HEATERS

A. Manufacturers:
   1. Hydro-Air Components, Inc; Model _____: www.rittling.com.
   2. TWA Panel Systems, Inc.; Model _____: www.twapanels.ca.
   3. Trane Inc; Model [_____]: www.trane.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceiling Panels: Constructed of modular 5 inch wide aluminum extrusions with interlocking edges; manufactured and assembled to sizes and configurations indicated.
   1. Pipe Coil: Incorporate extruded void into which continuous 1/2 inch copper pipe is rolled and thermally bonded. Provide return bends for two water connections to each panel.
   2. Cross brace entire assembly with structural members and insulate with 1 inch thick fiberglass insulation. Configure panels within T-bar ceiling module and run wall to wall.

C. Heating Capacity: As scheduled, based on 180 degrees F average water temperature, 70 degrees F space temperature.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Baseboard Radiation: Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units butt against walls.

E. Finned Tube Radiation: Locate on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Align cabinet joints with window mullions. Install wall angles where units butt against walls.

F. Convectors: Install where indicated. Coordinate to assure correct recess size for recessed convectors.

G. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

H. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

I. Fan-Coil Units: Install as indicated. Coordinate to assure correct recess size for recessed units.

J. Unit Ventilators: Locate as indicated, level and shim units, and anchor to structure. Coordinate exact location of wall louvers. Install shelving and auxiliary cabinetry. Provide wall trim pieces for continuous wall-to-wall installation.

K. Hydronic Units: Provide with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

L. Units with Cooling Coils: Connect drain pan to condensate drain.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION 23 8101