

SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Direct-expansion cooling.
 - 2. Gas furnace.
 - 3. Economizer outdoor- and return-air damper section.
 - 4. Integral, space temperature controls.
 - 5. Roof curbs.

1.2 DEFINITIONS

- A. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- B. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- C. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- D. Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- E. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.
- E. Warranty.

1.4 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigerant system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. AAON, Inc.
 2. Addison Products Company.
 3. Carrier Corporation.
 4. Engineered Air.
 5. Lennox Industries Inc.
 6. McQuay International.
 7. Trane; American Standard Companies, Inc.
 8. YORK International Corporation.
 9. Or Approved Equal.

2.2 CASING

- A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
- B. Exterior Casing Material: Galvanized steel with baked enamel finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
- C. Inner Casing Fabrication Requirements:
1. Inside Casing: Galvanized steel.
- D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
1. Materials: ASTM C 1071, Type I.
 2. Thickness: 1/2 inch.
 3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
 4. Liner Adhesive: Comply with ASTM C 916, Type I.
- E. Condensate Drain Pans: Formed sections of galvanized or stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1-2004.
1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
 2. Drain Connections: Threaded nipple.
 3. Pan-Top Surface Coating: Corrosion-resistant compound.
- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

2.3 FANS

- A. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

2.4 COILS

- A. Supply-Air Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Coil Split: Interlaced.
- B. Outdoor-Air Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

- A. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.
- B. Refrigeration Specialties:
 - 1. Refrigerant: R-410A.
 - 2. Expansion valve with replaceable thermostatic element.
 - 3. Refrigerant filter/dryer.
 - 4. Automatic-reset compressor motor thermal overload.
 - 5. Brass service valves installed in compressor suction and liquid lines.

2.6 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 - 1. Glass Fiber: Minimum 80 percent arrestance, and MERV 5.

2.7 GAS FURNACE

- A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.
- B. Burners: Stainless steel.
 - 1. Fuel: Natural gas.
 - 2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
- C. Heat-Exchanger and Drain Pan: Stainless steel.
- D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.
- E. Safety Controls:
 - 1. Gas Control Valve: Modulating.
 - 2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 DAMPERS

- A. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.
 - 1. Damper Motor: Modulating with adjustable minimum position.
 - 2. Relief-Air Damper: Gravity actuated with bird screen and hood.

2.9 ELECTRICAL POWER CONNECTION

- A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS

- A. Electronic Controller:
 - 1. Controller shall have volatile-memory backup.
 - 2. Safety Control Operation:
 - a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
 - b. Fire Alarm Control Panel Interface: Provide control interface to coordinate with existing fire alarm control panel.

3. Scheduled Operation: Occupied and unoccupied periods on seven 365-day clock with a minimum of two programmable periods per day.
4. Unoccupied Period:
 - a. Heating Setback: 10 deg F.
 - b. Cooling Setback: System off.
 - c. Override Operation: Two hours.
5. Supply Fan Operation:
 - a. Occupied Periods: Run fan continuously.
 - b. Unoccupied Periods: Cycle fan to maintain setback temperature.
6. Refrigerant Circuit Operation:
 - a. Occupied Periods: Cycle or stage compressors to match compressor output to cooling load to maintain room temperature. Cycle condenser fans to maintain maximum hot-gas pressure.
 - b. Unoccupied Periods: Compressors off.
7. Gas Furnace Operation:
 - a. Occupied Periods: Modulate burner to maintain room temperature.
 - b. Unoccupied Periods: Cycle burner to maintain setback temperature.
8. Economizer Outdoor-Air Damper Operation:
 - a. Occupied Periods: Open to 10 percent fixed minimum intake, and maximum 100 percent of the fan capacity to comply with ASHRAE Cycle II. Controller shall permit air-side economizer operation when outdoor air is less than 60 deg F. Use mixed-air temperature and select between outdoor-air and return-air enthalpy to adjust mixing dampers. During economizer cycle operation, lock out cooling.
 - b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.

B. Interface Requirements for HVAC Instrumentation and Control System:

- a. Provide LonTALK compatible interface for future connection to new DDC control system.

2.11 ACCESSORIES

- A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- C. Coil guards of painted, galvanized-steel wire.

2.12 ROOF CURBS

- A. Provide adaptor roof curb from existing curb to new unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unit Support: Install unit level on structural curbs. Secure RTUs to structural support with anchor bolts.
- B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- C. Install piping adjacent to RTUs to allow service and maintenance.
 - 1. Gas Piping: Connect existing gas piping service to new unit with new union and shutoff valve with sufficient clearance for burner removal and service.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:
 - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
 - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

3.3 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

END OF SECTION 237413