

SECTION 237416.13 - PACKAGED, LARGE-CAPACITY, AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged, large-capacity, air conditioning units (RTUs).

1.3 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

- 1. Factory selection calculations for each antimicrobial ultraviolet lamp installation.

- B. Shop Drawings:

- 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Filters: One set of filters for each unit.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Provide parts warranty extending either 12-months from date of unit start-up or a maximum of 18-months from unit ship date.
2. Compressor warranty: 5 years.
3. Warranty Period for Antimicrobial Ultraviolet Lamp System: Lifetime with exception of lamps.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The contractor shall furnish and install packaged unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
- B. AHRI Compliance:
 1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
- C. ASHRAE Compliance:
 1. Comply with ASHRAE 15 for refrigeration system safety.
- D. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CAPACITIES AND CHARACTERISTICS

- A. Refer to schedule on design drawings.

2.3 GENERAL DESCRIPTION

- A. Unit(s) furnished and installed shall be packaged unit(s) as scheduled on contract documents and described in these specifications. Unit(s) shall be designed for cooling only. For cooling modes the evaporator temperature shall be monitored, reported at unit controller. Compressor controls shall modulate capacity to maintain evaporator leaving set point. Hot Gas Bypass shall not be used to control compressor capacity.
- B. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
 1. Unit discharge airflow configuration shall be horizontal discharge thru side of pad-mount curb.

2.4 CABINET

- A. Cabinet panels: 2" double-wall foamed panel construction throughout the indoor section of unit to provide nonporous, cleanable interior surfaces. All interior seams exposed to airflow shall be sealed.

- B. Insulation: 2" polyisocyanurate foam metal encapsulated with no exposed edges. Initial R value of 6.6 per inch of thickness.
- C. Cabinet base shall be double wall construction designed to prevent trapping or ponding of water within the unit base. Cabinet base pan shall be insulated with 2" thick polyisocyanurate foam. Foam insulation shall be fully enclosed with galvanized steel insulation cover. Insulation shall not be applied to underside of unit base.
- D. Cabinet Base Rails: Side and end base rails shall include openings for forklift and tie-down access. To protect unit base from fork damage side rails shall include removable heavy gauge fork pockets.
- E. Shipping anchors attach to and/or through unit base rails. Straps over unit shall not be used to secure unit for shipping.
- F. Cabinet material interior and base rails: shall be G-90 zinc-coated galvanized steel. Material gauge shall be a minimum of 14-gauge for base rails, 16-gauge for structural members and 20-gauge for access doors and cabinet panels.
- G. Exterior Corrosion Protection: Exterior cabinet panels shall be a base coat of G-90 galvanized steel with both exterior and interior surfaces cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Unit's surface shall be in compliance with ASTM B45 salt spray testing at a minimum of 672 hour duration.
- H. Cabinet construction shall provide hinged panels providing easy access for all parts requiring routine service.
- I. Cabinet top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.
- J. Hinged Access Panels: Water- and air-tight hinged access panels shall provide access to all areas requiring routine service including air filters, heating section, electrical and control cabinet sections, optional ERV and power exhaust fan section, supply air fan section, evaporator and reheat coil sections. Insulated doors shall be constructed to allow the hinges to be reversed in the field.
 - 1. Hold-open devices shall be factory installed on all hinged access doors. Chains shall not be used as hold-open devices.
 - 2. Latches with locking hasp or tool operated closure devices shall be factory installed on all hinged access panels.
- K. Drain Pan material shall be Type 430 Stainless steel drain and constructed to sloped in two directions to ensure positive drainage with corners exposed to standing water and drain fittings welded liquid tight to prevent leaks. Pan shall have a minimum depth of 2". Base of drain pan shall be insulated with 1" thick foam insulation.
- L. Provide openings either on side of unit or thru the base for power and control connections.
- M. Air inlet hood shall be factory installed and shall not require field assembly. Hood shall include 2" thick removable aluminum mesh mist eliminators sized for a velocity not to exceed 500 FPM

at maximum unit rated airflow. Service access shall be hinged and held in place with thumb latches that shall not require tools for service access.

- N. Unit shall be equipped with a 6" filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the following section.

2.5 AIR FILTERS

- A. Unit inlet hood shall include 2" thick aluminum mesh removable mist eliminators with hinged access cover. Inlet velocity shall not exceed 500 FPM.
- B. Evaporator Inlet shall include a full complement of pleated media air filters. Filters shall be 2" deep MERV 8.

2.6 DAMPERS

- A. Unit shall include a motor operated outdoor air damper constructed of galvanized steel:
- B. Damper blades shall be air foil design with rubber edge seals designed not to exceed a 4 CFM/SQ FT leakage rate exceeding ASHRAE 90.1 damper leakage requirements.
- C. Damper actuator shall be factory mounted and wired sealed spring return and two-position.
- D. Dampers air velocity shall not exceed 2000 fpm.
- E. Return Air damper shall be of same material, construction and leakage rate as outdoor air damper. Return air damper actuator shall be factory mounted and wired sealed spring fully modulating and operate based on outdoor air damper feedback signal to properly regulate RA airflow.

2.7 COOLING

- A. Compressors:
 - 1. Units shall have direct-drive, digital scroll type compressors, all circuits.
 - 2. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage.
 - 3. Internal overloads shall be provided with the scroll compressors.
 - 4. Each compressor shall have a crankcase heater to minimize the amount of liquid refrigerant present in the oil sump during off cycles.
 - 5. Each compressor shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
 - 6. Provide each unit with two (2) hermetically sealed refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, liquid line charging port, suction and liquid line pressure ports, sight glass, and thermal expansion valve.
 - 7. Provide each circuit with automatic reset high and low pressure and high temperature switches for safety control.
- B. Coils:

1. Evaporator and Condenser coils shall be constructed with copper tubes mechanically bonded to configured aluminum plate fins.
2. Coils shall be factory leak tested in accordance ANSI/ASHRAE 15-1992 at a minimum pressure of 500 PSIG.
3. The condenser coil shall have a fin designed for ease of cleaning.
4. Evaporator coil shall include (six / four) rows of cooling interlaced for superior sensible and latent cooling with a maximum of 12 FPI for ease of cleaning.
5. Condenser coil hail guards shall be factory installed.
6. UVC Emitters/Lamps: Ultraviolet light (C band) emitters/lamps shall be incorporated downstream of evaporator coils, upstream of hot gas reheat coils, and above all drain pans to control airborne and surface microbial growth and transfer. Applied fixtures must be specifically manufactured for this purpose. Safety interlocks/features shall be provided to limit hazard to operating staff.

C. Condenser Section:

1. Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets.
2. Fans shall be statically and dynamically balanced.

2.8 FANS AND MOTORS

- A. Indoor fan shall be direct drive plenum fan, factory installed and wired to on-board Variable Frequency Drive and shall be equipped with slide out service access.
- B. All fan motors shall be premium efficiency ODP and meet the U.S. Energy Policy Act of 2005/10 (EPACT).
- C. All fan motors shall either be permanently lubricated and/ or have internal thermal overload protection.
- D. Outdoor fans shall be direct drive with premium efficiency motors, statically and dynamically balanced, draw through in the vertical discharge position.
- E. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

2.9 ELECTRICAL RATINGS AND CONNECTIONS

- A. All high voltage power components such as fuses, switches and contactors shall include a service personnel protection barrier or shall be a listed as touch-safe design.
- B. Field wiring access to be provided thru unit base into isolated enclosure with removable cover.
- C. Power wiring to be single point connection.
- D. Wiring internal to the unit shall be colored and numbered for identification.
- E. Unit shall be factory wired to field wiring terminal block mounted in isolated enclosure.

- F. Factory wired main power disconnect and overcurrent device shall be rated for total unit connected power.
- G. Unit SCCR rating shall be a minimum of 5Ka.
- H. Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and a fault code will be stored in the monitor for the most recent 25 faults. Upon correction of the fault condition the unit will reset and restart automatically.
 - 1. Phase Unbalance Protection: Factory set 2%.
 - 2. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage.
 - 3. Phase Loss/Reversal.
- I. All low voltage field wiring connections shall be made at factory installed low voltage terminal strip.

2.10 UNIT CONTROLS

- A. Main Unit Controller (MCM) shall be a microprocessor based controller with resident control logic. Controller program logic shall include Discharge Air control with unit conditioning modes enabled based on outdoor air conditions and controlled to maintain discharge air setpoints.
- B. MCM shall:
 - 1. Prevent simultaneous operation of any conditioning modes.
 - 2. Accept separate setpoints for Occupied and Unoccupied states.
 - 3. Include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
 - 4. Unit shall include minimum discharge air control.
- C. MCM Touch Screen shall include full color display and shall be (factory installed in unit control compartment / field mounted remote from unit and field wired up to a maximum of 300 ft.) and provide a full list of points included in the MCM. The display shall provide a list and history of all unit alarms.
- D. System Sensors shall include: Factory installed and wired Outdoor Air Temperature, Outdoor Air Humidity and Evaporator Leaving Air Temperature and factory furnished, field installed Discharge Air Temperature.
- E. System controls shall include:
 - 1. Anti-cycle timing.
 - 2. Minimum compressor run/off-times.

2.11 CURBS

- A. Contractor shall provide factory fabricated 38" tall curb pad-mount curb with horizontal duct connections. Curb shall be 14 gauge fully welded galvanized steel. Curb shall be insulated with

1" 2.25 lb foil faced insulation with divider wall for supply and return plenum sections. Curb floor and divider to be insulated with 1" 2.25 lb foil faced insulation. Curb shall house quantity six (6) 24" x 24" x 4" MERV 15 final filters with access door on front end of unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Curb: Install on concrete base, level and secure, according to AHRI Guideline B. Secure RTUs to upper curb rail, and secure curb base to concrete base with anchor bolts.

3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection and spill to grade.
- B. Install piping adjacent to RTUs to allow service and maintenance.
- C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts.
- D. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch high.
 - 2. Locate nameplate where easily visible.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

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.

B. RTU will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions.

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Verify lubrication on fan and motor bearings.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
13. Inspect and record performance of interlocks and protective devices; verify sequences.
14. Operate unit for an initial period as recommended or required by manufacturer.
15. Calibrate thermostats.
16. Adjust and inspect high-temperature limits.
17. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
18. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.
19. Inspect controls for correct sequencing of dampers, refrigeration, and normal and emergency shutdown.

20. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Outdoor-air intake volume.
21. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
22. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
 - a. Low-temperature safety operation.
 - b. Filter high-pressure differential alarm.
 - c. Smoke and firestat alarms.
23. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project 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.

3.7 DEMONSTRATION

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

END OF SECTION 237416.13