Special Environmental Packaged Rooftop Unit RTU-5

UMass Lowell 1499 Middlesex Street, Lowell MA, Printing Shop

Prepurchase Specifications

Part 1 - General

1.1 General Description

A. This section includes the design, controls and installation requirements for packaged gas/electric rooftop units / outdoor air handling units.

1.2 Quality Assurance

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.

B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

D. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.

E. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings, and IECC 2012.

F. Unit shall be safety certified by ETL and ETL US listed and shall bear such label. Unit nameplate shall include the ETL/ETL Canada label.

1.3 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicates assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation
point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.4 Delivery, Storage, and Handling

A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.5 Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for Installation, Operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters.

Part 2 - Products

2.1 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON, Trane, Valente.

2. Substitute equipment may be considered for approval that includes at a minimum:

   a. R-410A refrigerant.

   b. Variable capacity compressor with 10-100% capacity control.

   c. Direct drive supply fans.

   d. Double wall cabinet construction.

   e. Insulation with a minimum R-value of 13.

   f. Stainless steel drain pans.

   g. Hinged access doors at all sections.
2.2 Rooftop Units

A. General Description

1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, modulating hot gas reheat coil, modulating gas heaters, self contained integral unit controls, and BACnet card (for the future use).

2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment’s literature pocket.

3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.

5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.

6. Installation, Operation, and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment’s hinged access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment’s hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the
minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

6. Access to filters, dampers, cooling coils, reheat coil, heaters, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.

7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.

10. Unit shall include lifting lugs on the top of the unit.

C. Electrical

1. Unit shall be designed for 208V/3-Ph/ 60 Hz.

2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.

3. Unit shall be provided with a factory installed and factory wired 115V, 13 amp GFI outlet disconnect switch in the unit control panel.

4. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved plenum type supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.

3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. Relief Fans

1. Fans shall be direct drive, variable flow or minimum 2 stage type.

2. Integral control system operated to maintain space static pressure of 0.05”WG, positive (adjustable).

3. Space SP sensor tube and ceiling plate furnished to be installed in field.

F. Cooling Coils

1. Evaporator Coils
   a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
   b. Coils shall be 6 row high capacity type, or as required to meet the schedule performance criterion.
   c. Coils shall be hydrogen or helium leak tested.
   d. Coils shall be furnished with factory installed expansion valves.

F. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.

2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer’s recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.

6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.

7. Unit shall include a variable capacity scroll compressor on the refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.

8. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

9. Refrigeration circuit shall be equipped with a liquid line sight glass.

10. First capacity stage shall be provided with on/off condenser fan cycling and adjustable compressor lockout to allow cooling operation down to 35°F.

G. Condensers

1. Air-Cooled Condenser
   a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
   b. Coils shall be designed for use with R-410A refrigerant. Coils shall be multi-pass and fabricated from aluminum micro-channel tubes.
   c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
   d. Coils shall be hydrogen or helium leak tested.

2. Shall have hail guard tom protect condenser coil fins.

H. Gas Heating

1. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.

2. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.

3. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will
shut off the pilot when heating is not required.

4. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.

5. Natural gas furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature set point shall be adjustable on the electronic controller within the controls compartment.

6. Gas heating assemblies shall be capable of operating at any firing rate between 100% and 30% of their rated capacity.

I. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.

2. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511.

3. Damper assembly shall be controlled by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers. All damper shall be parallel or opposed blade type with indicated actuator type; back-draft type gravity dampers shall not be permitted.

J. Controls

1. Factory Installed and Factory Provided Controller

   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand-alone operation with unit configuration, set point adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

   b. Controller shall have an onboard clock and calendar functions that allow for
occupancy scheduling.

c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

d. Comparative enthalpy economizer controls.

e. Minimum outside air set point of 25%.

f. Space temperature sensor with local adjustment control panel, furnished, to be wired and installed in field.

g. Modulating hot gas reheat for space RH controls.

2. Variable Air Volume Controller- NA. Supply fan VFD shall be used for air balancing.

3. Sequence of Operation:
   a. Provide detailed sequence of operation based on the general parameters indicated hereinafter.
   b. Unit operates continuously 24/7.
   c. Unit compressors cycled and modulating hot gas operated to maintain cooling set point of 72F/50%RH.
   d. Comparative enthalpy economizer provide first stage of cooling whenever outdoor enthalpy is favorable for cooling. Relief fan(s) is staged or modulated to maintain space SP set point of +0.05”WG.
   e. Unit gas heat modulates to maintain 70F heating set point.
   f. Duct mounted electric steam humidifier modulates to maintain minimum humidity set point of 30%RH.
   g. Unit operates occupied period with 25% minimum OA, and operates unoccupied period with 0% minimum OA.

2.3 Curbs

A. Seismically rated spring isolator type Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit.

B. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

2.4 Equipment Schedule
A. Schedule based on Aaon.

B. Model- Aaon RN010.

C. Supply Fan- 3,500 CFM @0.3”ESP, VFD.

D. Minimum OA= 25%.

E. Cooling Coil- 3,500 CFM, 76.8/63.9 to 53.2/52.3, TC= 120 MBH, SC= 94 MBH.

F. Dehumidification- modulating hot gas reheat.

G. Gas Heating- natural gas, EAT= 56.5F, LAT= 88.2F, 150 MBH in/ 120 MBH out, minimum 4:1 turndown ratio, minimum gas pressure 4.5”/ maximum gas pressure 14”WG.

H. Compressors- Digital scroll first stage.

I. Electrical- 208/3.

**Part 3 – Execution**

3.1 Installation, Operation, and Maintenance

A. Installation, Operation, and Maintenance manual shall be supplied with the unit.

B. Provide factory representative start-up and installation approval.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

3.2 Shipping and Delivery

Unit shall be delivered to 1499 Middlesex Street, Lowell, MA 01854 and lifted on to the roof curb no later than **November 11, 2016**.
HVAC Unit
CL17-AJ-0013
Quotes due by 9/15/16

Heating & Cooling Unit $_____________

Model Name and # ____________________________________________________

Bidders must provide detailed specifications on unit proposing

Shipping & Handling including Rigging $_____________

Unit shall be delivered to 1499 Middlesex Street, Lowell, MA 01854 and lifted on to the roof curb no later than November 11, 2016

The University of Massachusetts Lowell is tax-exempt

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Company Name ____________________________________________

Address

__________________________________________________________

__________________________________________________________

__________________________________________________________

Telephone # ____________________________________________

Email address ____________________________________________

Contact Name ____________________________________________

Signature __________________________________________________

Date ______________________________________________________