

SECTION 23 81 00
DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies self-contained, air conditioners.
- B. Definitions:
 - 1. Energy Efficiency Ratio (EER): The ratio of net cooling capacity is Btu/h to total rate of electricity input in watts under designated operating conditions (Btu hour/Watt).
 - 2. Seasonal Energy Efficiency Ratio (EER): The ratio of the total cooling output of an air conditioner during its normal annual usage period for cooling in Btu/h divided by total electric energy input in watts during the same period (Btu hour/Watt).
 - 3. Unitary: A Unitary Air Conditioner consists of one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well.
 - 4. Where such equipment is provided in more than one assembly the separated assemblies are to be designed to be used together and the requirements of rating are based upon use of matched assemblies.

1.2 RELATED WORK

- A. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23.
- B. Section 23 07 11, HVAC and BOILER PLANT INSULATION: Requirements for piping insulation.
- C. Section 23 08 00 - COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training.

1.3 QUALITY ASSURANCE

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Safety Standards: ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

1.4 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- B. Manufacturer's literature and data:

1. Sufficient information, including capacities, pressure drops and piping connections clearly presented, shall be included to determine compliance with drawings and specifications for units noted below:
 - a. Unitary air conditioners:
 - 1) Self-contained units.
2. Unit Dimensions required clearances, operating weights accessories and start-up instructions.
3. Electrical requirements, wiring diagrams, interlocking and control wiring showing factory installed and portions to be field installed.
- C. Certification: Submit proof of specified ARI Certification.
- D. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required sensible-to-heat-ratio, energy efficiency ratio (EER), and coefficient of performance (COP).
- E. Operating and Maintenance Manual: Submit three copies of Operating and Maintenance manual to Resident Engineer three weeks prior to final inspection.
- F. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Military Specifications (Mil. Specs.):
MIL-PRF-26915D-06.....Primer Coating, for Steel Surfaces
- C. Air Movement and Control Association (AMCA):
210-07.....Laboratory Methods of Testing Fans for
Aerodynamic Performance Rating (ANSI)
410-96.....Recommended Safety Practices for Users and
Installers of Industrial and Commercial Fans
- D. American National Standards Institute (ANSI):
S12.51-02(R2007).....Acoustics - Determination of Sound Power Levels
of Noise Sources Using Sound Pressure -
Precision Method for Reverberation Rooms (same
as ISO 3741:1999)
- E. American Society of Heating, Refrigerating, and Air-Conditioning
Engineers (ASHRAE):

- 2008 Handbook.....HVAC Systems and Equipment
15-10.....Safety Standard for Refrigeration Systems (ANSI)
- F. National Electrical Manufacturer's Association (NEMA):
MG 1-09 (R2010).....Motors and Generators (ANSI)
ICS 1-00 (R2005, R2008).Industrial Controls and Systems: General
Requirements
- G. National Fire Protection Association (NFPA) Publications:
90A-09.....Standard for the Installation of Air-
Conditioning and Ventilating Systems

PART 2 - PRODUCTS

2.1 UNITARY AIR CONDITIONERS - GENERAL

- A. Applicable ARI Standards:
1. Cooling Capacity 39.6 kW (135,000 Btu/h) and More: AHRI 340/ 360.
 2. Cooling Capacity Less Than 39.6 kW (135,000 Btu/h): AHRI 210/240.
- Units shall be listed in the ARI Directory of Certified Unitary Air-Conditioners.
- B. Performance Rating: Cooling capacity of units shall meet the sensible heat and total heat requirements shown in the contract documents. In selecting unit size, make true allowance for "sensible to total heat ratio" to satisfy required sensible cooling capacity.

2.2 SELF-CONTAINED AIR CONDITIONERS

- A. Description: Factory assembled, tested, and wired floor mounted, portable air conditioning unit consisting of the following:
1. Cabinet.
 2. Compressor.
 3. Evaporator fan.
 4. Evaporator coil,
 5. Integral water-cooled condenser.
 7. Air filters.
 8. Controls.
 9. Full charge of refrigerant and oil.
 10. Integral condensate pump.
- B. Cabinet Frame and Panels: Structural-steel frame with galvanized-steel panels with baked-enamel finish in color selected by Architect, and with access doors or panels.
1. Insulation: Minimum 25-mm (1-inch) thick, aluminum foil faced glass fiber duct liner on cabinet interior and control panel.

2. Drain Pan: Galvanized steel with corrosion-resistant coating, Molded corrosion-resistant material, or Stainless steel insulated complying with ASHRAE 62.1-2007.
4. Discharge Plenum: Cabinet extension with directional louvers. .
5. Corrosion-Resistant Treatment: Phenolic coating on unit interior and exterior.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
7. Cabinet mounted caster wheels for portability.
8. Intake: Face mounted, integral to front cabinet access panel.
- C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- D. Fan Motors: Comply with requirements in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT for multi-tapped, multi-speed motors with internal thermal protection and permanent lubrication.
- E. Disposable Filters: 25 mm (1 inch) thick, in fiberboard frames with MERV rating of 7 or higher according to ASHRAE 52.2.
- F. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- G. Compressor hermetically sealed, scroll, 3600 rpm maximum, and resiliently mounted with positive lubrication and internal motor protection. Furnish each compressor with independent refrigeration circuits.
- H. Evaporator Coil: Direct-Expansion Coil: Seamless copper tubes expanded into aluminum fins with interlaced circuiting.
- I. Refrigerant Circuits: A separate circuit for each compressor, with externally equalized thermal-expansion valve with filter-dryer, sight glass, high-pressure relief valve, and charging valves.
- J. Water-Cooled Condenser: Copper tubes in steel shell with removable heads, for 2760-kPa (400-psig) waterside working pressure.
 1. ASME Compliance: For units larger than 15 tons fabricate and label water-cooled condensers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
 2. Water-Flow Switch.
- K. Refrigeration System: Factory assembled and tested, and charged with refrigerant; and consisting of piping and accessories connecting

compressor, evaporator coil, and condenser coil, and including the following:

2. Expansion valve with replaceable thermostatic element.
3. Refrigerant dryer.
4. High-pressure switch.
5. Low-pressure switch.
6. Thermostat for coil freeze-up protection during loss of air.
8. Brass service valves installed in discharge and liquid lines.
9. R-407C or R-410A refrigerant unless otherwise indicated.

L. Terminate suction and liquid refrigerant piping with service valves within unit.

M. Air Filters:

1. Disposable Filters: 25 mm (1 inch) thick, glass-fiber, flat MERV 7 panel filters.
2. Filter Efficiency: MERV rating as specified above according to ASHRAE 52.2.

N. Controls:

1. Control Package: Factory wired, including contactor, high- and low-pressure cutouts, internal-winding thermostat for compressor, control-circuit transformer, and noncycling reset relay.
2. Time-Delay Relay: Five-minute delay to prevent compressor cycling.
3. System Selector Switch: Off-auto-cool .
4. Fan Control Switch: Auto-on.
5. Electronics: Microprocessors shall monitor and control numerous functions for the unit such as digital display and touch panels for programming desired temperature, on-off timing, modulating fan speeds, bypass capabilities, and sensing for humidity, temperature and airflow control.

O. Condensate Pump: Pump shall integral to unit and include pump & tank overflow alarms.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb maintaining manufacturer's recommended clearances and tolerances.
- B. Install water-cooled units with thermometer and pressure gage at the water supply and return connection.

3.2 CONNECTIONS

- A. Verify condensate drainage requirements.

- B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest floor drain or mop sink.
- C. Install piping adjacent to units to allow service and maintenance.
- D. Ground equipment and install power wiring, switches, and controls for self contained and split systems.
- E. Connect piping with shutoff duty valves on the supply and return side of the water cooled condenser and unions at all connections.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections: After installing units and after electrical circuitry has been energized, test units for compliance with requirements. Inspect for and remove shipping bolts, blocks, and tie-down straps. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP AND TESTING

The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior notice.

3.5 COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00 - COMMISSIONING OF HVAC SYSTEMS for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
- B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 23 08 00 - COMMISSIONING OF HVAC SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.6 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.
- B. Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00 - COMMISSIONING OF HVAC SYSTEMS.

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