

SECTION 23 81 00
DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies split-systems.
- B. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- C. 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 greater 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 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- C. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- D. Section 03 30 00, CAST-IN-PLACE CONCRETE.
- E. Section 07 72 00, ROOF ACCESSORIES.
- F. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- G. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
- H. Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- I. Section 23 05 93, TESTING, ADJUSTING, and BALANCING FOR HVAC.
- J. Section 23 07 11, HVAC and BOILER PLANT INSULATION.
- K. Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.
- L. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

- M. Section 23 11 23, FACILITY NATURAL-GAS PIPING.
- N. Section 23 23 00, REFRIGERANT PIPING.
- O. Section 23 31 00, HVAC DUCTS and CASINGS.
- P. Section 23 36 00, AIR TERMINAL UNITS.
- Q. Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.
- R. Section 23 82 16, AIR COILS.
- S. Section 28 31 00, FIRE DETECTION and ALARM.

1.3 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 81 00, DECENTRALIZED UNITARY HVAC EQUIPMENT", with applicable paragraph identification.
- C. Manufacturer's literature and data Including:
 - 1. Sufficient information, including capacities, pressure drops, and piping connections clearly presented, shall be included to determine compliance with contract documents for units noted below:
 - a. Unitary air conditioners:
 - 1) Split systems
 - 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.
 - 4. Mounting and flashing of the roof curb to the roofing structure with coordinating requirements for the roof membrane system.
- D. Certification: Submit proof of specified ARI Certification.
- E. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required sensible-to-heat-ratio, integrated energy efficiency ratio (IEER), and coefficient of performance (COP).
- F. Operating and Maintenance Manual: Submit three copies of Operating and Maintenance manual to COR three weeks prior to final inspection.
- G. Completed System Readiness Checklists provided by the CxA 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.

1.4 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.

1.5 **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. Where conflicts occur these specifications and the VHA standards will govern.

B. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
210/240-2023.....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
270-2015.....Sound Rating of Outdoor Unitary Equipment
340/360- (I-P 2019).....Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
520-//2004//.....Performance Rating of Positive Displacement Condensing Units

C. Air Movement and Control Association (AMCA):
210-2016.....Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)
410-1996.....Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans

D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
Handbook 2020.....HVAC Systems and Equipment
15-2019.....Safety Standard for Refrigeration Systems (ANSI)
62.1-2019.....Ventilation for Acceptable Indoor Air Quality (ANSI)

E. Military Specifications (Mil. Specs.):
MIL-PRF-26915D-2006.....Primer Coating, for Steel Surfaces

F. National Electrical Manufacturer's Association (NEMA):
ICS 1-2005.....Industrial Controls and Systems: General Requirements
MG 1-2016 (R2019).....Motors and Generators (ANSI)

G. National Fire Protection Association (NFPA) Publications:
90A-2021.....Standard for the Installation of Air-Conditioning and Ventilating Systems

1.6 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 2 - PRODUCTS

2.1 SPLIT-SYSTEM AIR CONDITIONERS

- A. Description: Factory assembled and tested, floor-mounted and wall-mounted units, with an air-cooled remote condensing unit, and field-installed refrigeration piping.
- B. Concealed Evaporator Components:
 - 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 2. Insulation: Factory-applied duct liner.
 - 3. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1.
 - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 - 5. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
 - 6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
 - 7. 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.
 - 8. Disposable Filters: 25 mm (1 inch) thick, in fiberboard frames with MERV rating of 7 or higher according to ASHRAE 52.2.
 - 9. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- C. Floor-Mounting, Evaporator-Fan Components:
 - 1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect.
 - 2. Discharge Grille: Steel with surface-mounted frame
 - 3. Insulation: Factory-installed duct liner.
 - 4. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1.
 - 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

6. Coils:
 - a. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
 7. Fan: Direct drive, centrifugal.
 8. 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.
 9. Filters: Disposable, with MERV rating of 7 or higher according to ASHRAE 52.2.
- D. Wall-Mounting, Evaporator-Fan Components:
1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 3. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2007.
 4. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
 5. Fan: Direct drive, centrifugal fan.
 6. 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. Air-Cooled, Compressor-Condenser Components:
1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Service valves, fittings, and gauge ports shall be brass and located outside of the casing.
 2. Compressor: Hermetically sealed variable speed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 3. Compressor motor with manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
 4. Refrigerant: R-407C or R-410A unless otherwise indicated.

5. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
6. Fan: Aluminum, propeller type, directly connected to motor.
7. Motor: Permanently lubricated, with integral thermal-overload protection.
8. Low Ambient Kit: Permit operation down to minus 18 degrees C (0 degrees F).
9. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1 "Energy Standard for Buildings except Low-Rise Residential Buildings."
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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." ARI Guideline B.
- B. Install wind and seismic restraints according to manufacturer's written instructions. Wind and seismically restrained vibration isolation roof-curb rails are specified in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- C. Install units level and plumb maintaining manufacturer's recommended clearances and tolerances.
- D. Install vibration spring isolators under base of self-contained unit, with minimum static deflection of 25 mm (1 inch) unless otherwise indicated. Refer to Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT
- E. Install ground-mounting, compressor-condenser components on 100 mm (4-inch) thick, reinforced concrete base; 100 mm (4 inches) greater on each side than unit. Concrete, reinforcement, and formwork are specified in Section 03 30 00, CAST-IN-PLACE CONCRETE. Coordinate anchor installation with concrete base.
- F. Install ground-mounting, compressor-condenser components on polyethylene mounting base.
- G. Install roof-mounting compressor-condenser components on equipment supports specified in Section 07 72 00, ROOF ACCESSORIES. Anchor units to supports with removable, cadmium-plated fasteners.
- H. Install seismic restraints.

- I. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 25 mm (1 inch) unless otherwise indicated. Refer to Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- J. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- K. Install wall sleeves in finished wall assembly and weatherproof. Install and anchor wall sleeves to withstand, without damage seismic forces as required by code.

3.2 CONNECTIONS

- A. Verify condensate drainage requirements.
- B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- C. Install piping adjacent to units to allow service and maintenance.
- D. Connect supply ducts to units with flexible duct connectors specified in Section 23 31 00, HVAC DUCTS and CASINGS.
- E. Install return-air duct continuously through roof structure.
- F. Ground equipment and install power wiring, switches, and controls for self-contained and split systems.
- G. Connect refrigerant piping to coils with shutoff valves on the suction and liquid lines at the coil and a union or flange at each connection at the coil and condenser.
- H. Install ducts to the units with flexible duct connections.
- I. Connect piping with shutoff duty valves on the supply and return side of the coil and unions at all connections and with a throttling valve on the return piping near the coil.
- J. Connect piping with shutoff duty valves on the supply and return side of the water-cooled condenser and unions at all connections and with a throttling valve on the return piping near the condenser
- K. Connect piping with shutoff duty valves and unions on the steam supply and condensate side of the steam coil. On the condensate line near the coil provide a strainer, trap and shutoff valve.

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

- A. The CxA will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and CxA. Provide a minimum of 7 days prior notice.
- B. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.

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 CxA.
- 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 4hoursto 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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