

SECTION 23 81 43
SPLIT DUCTLESS AIR CONDITIONING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section describes the requirements for split ductless air conditioning system.
- B. Definitions:
 - 1. Coefficient of Performance (COP) - Cooling: The ratio of the rate of heat removed to the rate of energy input in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
 - 2. Coefficient of Performance (COP) - Heating: The ratio of the rate of heat delivered to the rate of energy input is consistent units for a complete heat pump system, including the compressor and, if applicable, auxiliary heat under designated operating conditions.
 - 3. 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.
 - 4. Heating Seasonal Performance Factor (HSPF) - Total heating output of heat pump during its normal annual usage period for heating in Btu/h divided by total electric energy input in watts during the same period.
 - 5. Seasonal Energy Efficiency Ratio (SEER) - 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.
 - 6. Air-Source Unitary Heat Pump: One or more factory made assemblies that normally include an indoor conditioning coil, compressor(s) and an outdoor refrigerant-to-air coil. These units provide both heating and cooling functions.

1.2 RELATED WORK:

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- E. Section 23 23 00, REFRIGERANT PIPING.

1.3 QUALITY ASSURANCE:

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Comply with the latest version of ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.
- C. Comply with the latest version of ASHRAE Standard 90.1, Energy Standard for Buildings except Low-Rise Residential Buildings for Cooling and Heating performance requirements when tested in accordance with AHRI 210/240 or 340/360 and UL 1995.
- D. Comply with requirements in Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

1.4 SUBMITTALS:

- A. Submit manufacturer's literature and data in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
 - 1. Split ductless air conditioning system.
 - 2. Control system: Submit full control package, including control shop drawings, control sequence of operation description, and control components in order to monitor room temperature and alarms through existing BAS/BMS in ECC room (EB-120) at Building 100.
 - 3. Condensate pump package.
- B. Certification: Submit, simultaneously with shop drawings, a proof of certification that this product has been certified by AHRI.
- C. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities EER and COP values as applicable.

1.5 APPLICABLE PUBLICATIONS:

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.

- A. Federal Specification (Fed. Spec.):
 - A-A-50502-90.....Air-Conditioner (Unitary Heat Pump), Air to Air (3000 to 300,000 BTUH)
- B. Air-Conditioning Heating and Refrigeration Institute (AHRI) Standards:
 - AHRI-DCPP.....Directory of Certified Product Performance - Applied Directory of Certified Products
 - 210/240-08.....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment

- 270-09.....Sound Rating of Outdoor Unitary Equipment
- 310/380-04.....Standard for Packaged Terminal Air-Conditioners
and Heat Pumps (CSA-C744-04)
- 340/360-07.....Commercial and Industrial Unitary Air-
Conditioning and Heat Pump Equipment
- 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):
- S12.51-12.....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 Inc (ASHRAE):
- 15-10.....Safety Standard for Refrigeration Systems
(ANSI)
- 62.1-10.....Ventilation for Acceptable Indoor Air Quality
(ANSI)
- 90.1-10.....Energy Standard for Buildings except Low-Rise
Residential Buildings
- 2008 Handbook.....HVAC Systems and Equipment
- F. American Society of Testing and Materials (ASTM):
- B117-11.....Standard Practice for Operating Salt Spray
(Fog) Apparatus
- D4587-11.....Standard Practice for Fluorescent UV-
Condensation Exposures of Paint and Related
Coatings.
- G. National Electrical Manufacturer's Association (NEMA):
- MG 1-11.....Motors and Generators (ANSI)
- ICS 1-00 (R2008).....Industrial Controls and Systems: General
Requirements
- H. National Fire Protection Association (NFPA):
- 90A-11.....Standard for the Installation of Air-
Conditioning and Ventilating Systems

I. Underwriters Laboratory (UL):

778-10.....Motor Operated Water Pumps

1995-11.....Heating and Cooling Equipment

1.5 AS-BUILT DOCUMENTATION

- A. The electronic documentation and copies of the Operations and Maintenance Manual, approved submittals, shop drawings, and other closeout documentation shall be prepared by a computer software program complying with Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C 794d). The manufacturer or vendor of the software used to prepare the electronic documentation shall have a Voluntary Product Accessibility Template made available for review and included as part of the Operations and Maintenance Manual or closeout documentation. All available accessibility functions listed in the Voluntary Accessibility Template shall be enabled in the prepared electronic files. As Adobe Acrobat is a common industry format for such documentation, following the document, "Creating Accessible Adobe PDF files, A Guide for Document Authors" that is maintained and made available by Adobe free of charge is recommended."
- B. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- C. Four (4) sets of operation and maintenance data updated to include submittal review comments shall be inserted into a three ring binder. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- D. Four (4) sets of control documents, including as-built control sequence of operation description, control shop drawings and final test report.

PART 2 - PRODUCTS

2.1 SPLIT DUCTLESS AIR CONDITIONING SYSTEM

- A. Split ductless air conditioning system shall comply with Fed Spec A-A-50502, having factory assembled refrigerant circuit or circuits (Packaged Unit), system having remote outdoor section separate from indoor Section with cooling capacity up to 65,000 Btu/hr.

- B. The split system shall bear the United States Environmental Protection Agency (EPA), Energy Star label and shall have a minimum Seasonal Energy Efficiency Ratio (SEER) of 17.5.
- C. Applicable AHRI Standards: Units shall be listed in the corresponding ARI Directory of Certified products shown in paragraph, APPLICABLE PUBLICATIONS:
 - 1. Capacity less than 19 KW (65,000 Btu/hr), Comply with AHRI 210/240.
 - 2. Capacity above 19 KW (above 65,000 Btu/hr), Comply with AHRI 340/360.
- D. Casing: Unit shall be constructed of zinc coated, heavy-gage, 14-gage minimum, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit surfaces shall be tested 500 hours in a salt spray test in compliance with ASTM B117. Cabinet panels shall have lifting handles and shall be water- and air-tight seal. All exposed vertical, top covers and base pan shall be insulated with 25-mm (1-inch) matt-faced, fire-resistant, odorless, glass fiber material. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1. The base of the unit shall have provisions for forklift and crane lifting.
- E. Filters: Provide mold-proof air filter and titanium apatite photocatalytic air purifying filter that shall trap microscopic particles, decompose odors, adsorb and deactivate bacteria and viruses.
- F. Compressors: Compressors shall be direct-drive, hermetic scroll type with centrifugal type oil pumps. Motor shall be suction gas-cooled. Internal overloads and crankcase heaters shall be utilized with all compressors.
- G. Refrigerant: R-410A.
- H. Refrigerant Circuit: A minimum of two circuits is required. Each refrigerant circuit shall have independent fixed orifice or thermostatic expansion devices, service pressure ports, and refrigerant line filter driers factory installed as standard. An area shall be provided for replacement suction line driers.
- I. Evaporator and Condenser Coils: Internally finned, DN 10 (NPS 3/8) copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. The evaporated coil and condenser coil shall be leak tested at the factory to 1378 kPa (200 psig) and pressure tested to

2756 kPa (400 psig). All dual compressor units shall have intermingled evaporator coils. Sloped condensate drain pans shall be provided.

- J. Outdoor fans: Direct driven, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motors shall be permanently lubricated and shall have built-in thermal overload protection.
- K. Automatic Defrosting: Sensor shall perform automatic defrosting of the outdoor heat exchanger to ensure optimum performance.
- L. Auto Restart: The unit shall memorize the operation mode, airflow and temperature settings. It shall automatically return to the same operating conditions when the power is restored.
- M. Self Diagnosis: Any malfunction codes shall be displayed on the liquid crystal panel (LCD) of indoor wired temperature control panel for fast and easy fault diagnosis.
- N. 3-D Airflow: The indoor wall-mounted evaporator shall include combination of vertical and horizontal auto-swings to circulate cool air to the corners of required spaces.
- O. Outdoor condenser unit shall include, but not be limited to stop valves for gas and liquid lines with stub out piping for field connections, compressor, heat exchanger, and fan motor.
- P. Wall-mounted indoor evaporator components:
 - 1. Cabinet: Enameled steel with removable panels on front and ends 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.
 - 4. Fan: Drive driven, centrifugal fan.
 - 5. Built-in room temperature sensor: Detect the air temperature around the unit.
- Q. Unit electrical
 - 1. Provide single point unit power connection.
 - 2. Unit control box shall be located within the unit and shall contain controls for compressor, reversing valve and fan motor operation and shall have a 50 VA 24-volt control circuit transformer and a terminal block for low voltage field wiring connections.
 - 3. Safety Controls - High pressure, low temperature, and low pressure safety switches shall be wired through a latching lockout circuit to

hold the conditioner off until it is reset electrically by interrupting the power supply to the conditioner. All safety switches shall be normally closed, opening upon fault detection.

R. System Control Functions:

1. Auto restart after power failure.
2. Self-diagnosis display.
3. 3-D airflow control.
4. Auto fan speed.
5. Provide external relay contacts and necessary components for monitoring signal outputs, including normal operation and malfunction alarms.

2.2 CONTROL PACKAGE

- A. Control package shall include, but not be limited to control sequence of operation description, control shop drawings, and control components. All control components shall be compatible with existing control system.

2.3 CONDENSATE PUMP PACKAGE

- A. Provide new condensate pump package with reservoir, drain point, filters, hoses, and auxiliary components to collect condensate/moisture from indoor evaporator.
- B. The sensor/reservoir housing shall be transparent to facilitate inspection. Housing shall disassemble easily to facilitate cleaning and maintenance and shall include a stainless steel mesh filter which shall be easily removable for cleaning.
- C. The sensor/reservoir housing shall incorporate an electronic water level sensor with a quick connect telephone type jack to facilitate installation and removal.
- D. The sensor shall include volt free normal open (NO) and normal close (NC) contacts for overflow alarm and safety purposes which shall be rated at not less than 5 amp inductive and 3 amp resistive at line voltage. Power wiring shall be color coded in conformance with NFPA 70, NEC.
- E. The pump shall be self priming, operate automatically on water rise, have a capacity of not less than 0.8 gallon per hour (GPH) at 26 feet head and operate at a maximum of 35 dBA of noise level.
- F. The pump shall be thermally protected, potted for water resistance, UL or ETL listed in conformance with UL 778 and shall incorporate a single

water resistant modular push-on electrical terminal for both primary power and alarm wires to facilitate installation and removal.

2.3 CORROSION PROTECTION

A. Remote Outdoor Condenser Coils: Epoxy Immersion Coating - Electrically Deposited: The multi-stage corrosion-resistant coating application comprises of cleaning (heated alkaline immersion bath) and reverse-osmosis immersion rinse prior to the start of the coating process. The coating thickness shall be maintained between 0.6-mil and 1.2-mil. Before the coils are subjected to high-temperature oven cure, they are treated to permeate immersion rinse and spray. Where the coils are subject to UV exposure, UV protection spray treatment comprising of UV-resistant urethane mastic topcoat shall be applied. Provide complete coating process traceability for each coil and minimum five years of limited warranty. The coating process shall be such that uniform coating thickness is maintained at the fin edges. The quality control shall be maintained by ensuring compliance to the applicable ASTM Standards for the following:

1. Salt Spray Resistance (Minimum 6,000 Hours).
2. Humidity Resistance (Minimum 1,000 Hours).
3. Water Immersion (Minimum 260 Hours).
4. Cross-Hatch Adhesion (Minimum 4B-5B Rating).
5. Impact Resistance (Up to 160 Inch/Pound).

B. Exposed Outdoor Cabinet: Casing Surfaces (Exterior and Interior): All exposed and accessible metal surfaces shall be protected with a water-reducible acrylic with stainless steel pigment spray-applied over the manufacturer's standard finish. The spray coating thickness shall be 2-4 mils and provide minimum salt-spray resistance of 1,000 hours (ASTM B117) AND 500 hours UV resistance (ASTM D4587).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install split ductless air conditioning system in accordance with manufacturer's installation instructions.
- B. Install condensate pump package in accordance with manufacturer's installation instructions.
- C. Install electrical and control devices furnished by the manufacturer, but not specified to be factory mounted. All electrical work shall comply with Division 26 Sections.

- D. Install all control devices and integrate them to existing BAS/BMS system per the approved control shop drawings.
- E. Piping and Insulation: Comply with requirements in Section 23 23 00, Refrigerant Piping.

3.2 STARTUP AND TESTING

- A. Perform startup checks according to manufacturer's written instructions.
- B. Test controls and demonstrate its compliance with project requirements. Replace damaged or malfunctioning controls and equipment and retest the equipment to the satisfaction of the COR. Submit the final control test report to the COR for record.
- C. Furnish test reports to the COR in accordance with specification Section 01 00 00, GENERAL REQUIREMENTS.

3.3 INSTRUCTIONS

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of the systems.

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