

**SECTION 23 81 43  
AIR-SOURCE UNITARY HEAT PUMPS**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. This section does not include every possible type of heat pump available. Edit this section properly to suit specific project.

DESIGNER NOTES:

1. Seismic Design Requirements, H-18-8.
2. Minimum Energy Efficiency Requirements; show on drawings applicable minimum energy efficiency requirements from Table 6.2.1B, ASHRAE 90.1.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This Section specifies electrically operated unitary and applied air-source heat pumps.
- 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. A higher rating indicates better energy efficiency.
  2. 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. Higher COPs equates to lower operating costs.
  3. 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. Higher COPs equate to lower operating costs. Note that the COP may exceed 1, because, instead of just converting work to heat (which,

- if 100 percent efficient, would be a COP of 1), it pumps additional heat from a heat source to where the heat is required.
4. Heating Seasonal Performance Factor (HSPF): The ratio of total heating output (BTUH) to the total seasonal input (watt-hours) for air source heat pumps. Units = Btu/watt-hr.
  5. Unitary Heat Pump: One or more factory made assemblies that normally include an indoor conditioning coil, compressor(s), and an outdoor refrigerant-to-air heat exchanger. These units provide both heating and cooling functions.

## 1.2 RELATED WORK

SPEC WRITER NOTE: Retain one of two paragraphs below.

- A. //Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects).//
- B. //Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects).//
- C. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Section 01 42 19, REFERENCE STANDARDS.
- E. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- F. //Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.//

SPEC WRITER NOTE: If Section 13 05 41 is included in this project the section shall be obtained from VA Masters.

- G. //Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Seismic reinforcing.//
- H. 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.
- I. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC EQUIPMENT.
- J. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Requirements for testing, adjusting, and balancing of HVAC system.
- K. //Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//
- L. //Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.//
- M. Section 23 23 00, REFRIGERANT PIPING: Requirements for field refrigerant piping.
- N. Section 23 31 00, HVAC DUCTS AND CASINGS: Requirements for sheet metal ductwork.
- O. Section 23 81 00, UNITARY HVAC EQUIPMENT.

**1.3 APPLICABLE PUBLICATIONS**

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all mechanical systems. Publications that apply to all mechanical systems may not be specifically referenced in the body of the specification, but, shall form a part of this specification.

- 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. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
  - 210/240-2008.....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
  - 340/360-2007.....Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc. (ASHRAE):
  - 15-2013.....Safety Standard for Refrigeration Systems
  - 52.2-2012.....Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
  - 62.1-2013.....Ventilation for Acceptable Indoor Air Quality
  - 90.1-2013.....Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings
- D. American Society of Testing and Materials (ASTM):
  - B117-2011.....Standard Practice for Operating Salt Spray (Fog) Apparatus
- E. Underwriters Laboratory (UL):
  - 181-2013.....Standard for Factory-Made Air Ducts and Air Connectors
  - 1995-2015.....Heating and Cooling Equipment

**1.4 SUBMITTALS**

- A. Submittals, including number of required copies, shall be submitted in accordance with 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 43, AIR-SOURCE UNITARY HEAT PUMPS", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
  - 1. Unitary Heat pumps, Air-to-Air:
    - a. Packaged units
    - b. Split system
- D. Certification: Submit, simultaneously with shop drawings, a proof of certification that this product has been certified by AHRI.
- E. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities, EER, and COP values.
- F. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
  - 1. Include complete list indicating all components of the systems.
  - 2. Include complete diagrams of the internal wiring for each item of equipment.
  - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- G. //Completed System Readiness Checklist 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.//
- H. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

#### **1.5 QUALITY ASSURANCE**

- A. Refer to paragraph QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Comply with ASHRAE 15. Comply with ASHRAE 90.1, //AHRI 210/240// //AHRI 340/360//, and UL 1995.

#### **1.6 AS-BUILT DOCUMENTATION**

SPEC WRITER NOTE: Coordinate O&M Manual requirements with Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects)

or Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects). O&M manuals shall be submitted for content review as part of the close-out documents.

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be //in electronic version on CD or DVD// inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. 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.
- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version //\_\_\_\_// provided on CD or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

## **PART 2 - PRODUCTS**

### **2.1 UNITARY HEAT PUMPS, AIR TO AIR**

- A. Units: //Type I, having factory assembled refrigerant circuit or circuits (Packaged Unit)// //Type II, (Split System) having remote outdoor section separate from indoor section//.

1. Unitary heat pumps: Comply with ASHRAE 90.1 minimum equipment efficiency requirements and with AHRI 210/240 and AHRI 340/360 as applicable.
- B. Casing: Unit constructed of zinc coated, 14-gage minimum galvanized steel. Clean exterior surfaces shall be phosphatized and finished with a weather-resistant baked enamel finish. Test unit surfaces 500 hours in a salt spray test in compliance with ASTM B117. Cabinet panels lifting handles water- and air-tight seal. All exposed vertical, top covers and base pan, insulated with //15 mm (1/2 inch)// //25 mm (1 inch)// //50 mm (2 inch)// matt-faced, fire-resistant, odorless, glass fiber material complying with UL 181. Surfaces in contact with the airstream comply with requirements in ASHRAE 62.1. The base of the unit have provisions for forklift and crane lifting.
- C. Filters: 25 mm (1 inch) thick, MERV 8, according to ASHRAE 52.2, throwaway filter, standard on all units less than 26.4 kW (7-1/2 tons). Filter rack can be converted to two inch capability. Provide 50 mm (2 inch) thick, MERV 8, according to ASHRAE 52.2, throwaway filters on all units greater than 26.4 kW (7-1/2 tons).
- D. Compressors: Direct-drive scroll type. Provide internal overload with the compressors. Utilize crankcase heaters with all compressors.
- E. Refrigerant Circuit: Independent fixed orifice or thermostatic expansion devices, service pressure ports, and refrigerant line filter-driers factory installed as standard. Provide an area for replacement suction line driers. Charge refrigerant circuit with any CFC or HCFC free refrigerant.
- F. Evaporator and Condenser Coils: Internally finned, DN 10 (NPS 3/8) copper tubes mechanically bonded to a configured aluminum plate fin. The evaporator coil and condenser coil leak tested at the factory to 1380 kPa (200 psig) and pressure tested to 2758 kPa (400 psig). Dual compressor units shall have intermingled evaporator coils. Sloped condensate drain pans are standard.
- G. Outdoor fans: Direct driven, statically and dynamically balanced, draw-through in the vertical discharge position. Fan motors permanently lubricated and built-in thermal overload protection.
- H. Indoor Fan: //Direct// //Belt// driven, forward-curved centrifugal with adjustable motor sheaves //adjustable idler-arm assembly for quick-adjustment of fan belts and motor sheaves//. Motors thermally protected. Oversize motors will be available for high static

application. Motors shall comply with Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC EQUIPMENT.

- I. Defrost Controls: A time initiated, temperature terminated defrost system, ship with a setting of 70-minute cycle, with a choice of 50- or 90-minute cycle. Timed override limits defrost cycle to 10 minutes will be available on units from 35 to 70 kW (10 to 20 tons). Provide adaptive demand defrost on units less than 26.4 kW (7-1/2 tons).
- J. Controls: Factory wired with controls and contactor pressure lugs or terminal block for power wiring. Provide micro-processor controls for all 24-volt control functions. The resident control algorithms will make heating, cooling, and ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. Controls include an anti-short-cycle timing and time delay between compressors.
  - 1. //Thermostat: Wall-Mounted Automatic Programmable Thermostat// with lockable cover//.//
- K. Accessories:
  - 1. //Electric Heater: Constructed of heavy-duty nickel chromium elements. Staging achieved through the unit control processor. Each heater automatically reset high limit control. Heaters individually fused from the factory and will comply with NEC requirements. Provide power assemblies single point connection. Electric heat modules shall be UL listed and labeled.//
  - 2. Economizer: //Down flow// //Horizontal flow//; //field// //factory// installed; and include fully modulating 0-100 percent motor and dampers, barometric relief, minimum position setting and fixed dry bulb. //Solid state enthalpy and differential enthalpy control//.
  - 3. //Oversized Motors: //Factory// //Field// installed over sized motor available for high-static application.//
- L. //Comply with requirements in Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for Control equipment and sequence of operation.//

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.
- B. Install heat pumps according to manufacturers printed 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. Ductwork: Comply with requirements in Section 23 31 00, HVAC DUCTS AND CASINGS.
- E. Piping: Comply with requirements in Section 23 23 00, REFRIGERANT PIPING.

### **3.2 //SEISMIC BRACING**

- A. Comply with requirements in Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//

### **3.3 STARTUP AND TESTING**

- A. Perform startup checks according to manufacturer's written instructions.
- B. Test controls and demonstrate compliance with project requirements. Replace damaged or malfunctioning controls and equipment and retest the equipment to the satisfaction of the COR.
- C. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- D. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- E. //The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.//

### **3.4 //COMMISSIONING**

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

### **3.5 DEMONSTRATION AND TRAINING**

- A. Provide services of manufacturer's technical representative for //four// // // hour//s// to instruct each VA personnel responsible in the 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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