SECTION 238146 - WATER-SOURCE UNITARY HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of water-source heat pumps:
   1. Concealed horizontal or vertical units.
   2. Rooftop units.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each model.
B. Field quality-control test reports.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance:
   1. ASHRAE 15.
   2. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
   3. Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning"

B. Comply with NFPA 70.
C. Comply with safety requirements in UL 484 for assembly of free-delivery water-source heat pumps.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace refrigeration components of water-source heat pumps that fail in materials or workmanship within five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONCEALED WATER-SOURCE HEAT PUMPS

A. Approved Manufacturers:
1. American Standard
2. Trane.

B. Description: Packaged water-source heat pump with temperature controls; factory assembled, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Galvanized-steel casing with the following features:
1. Access panel for access and maintenance of internal components.
2. Cabinet Insulation: Glass-fiber liner, minimum 1/2 inch thick, passing UL 181.
3. Condensate Drainage: Plastic or stainless-steel drain pan with condensate drain piping projecting through unit cabinet
4. Sound Attenuation Package:
   a. Minimum 0.598-inch thick compressor enclosure and front panel.

D. Fan: Direct driven, centrifugal with multispeed motor resiliently mounted in fan inlet.
1. General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

E. Water Circuit:
1. Refrigerant-to-Water Heat Exchangers: Coaxial heat exchangers with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.
2. Motorized Water Valve: Stop water flow through the unit when compressor is off.

F. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:
2. Charging Connections: Service fittings on suction and liquid for charging and testing.
3. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
4. Compressor: Hermetic [rotary] [reciprocating] [scroll] compressor installed on vibration isolators and housed in an acoustically treated enclosure with factory-installed safeties as follows:
   a. Antirecycle timer.
   b. High-pressure cutout.
   c. Low-pressure cutout or loss of charge switch.
   d. Internal thermal-overload protection.
   e. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 35 deg F
   f. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.
6. Pipe Insulation: Refrigerant minimum 3/8-inch-thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.
8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 25 to 125 deg F.

H. Electric Heating Coil: Helix-wound, nickel-chromium wire-heating elements in ceramic insulators mounted on steel supports. Energize on call for heating when entering-water-loop temperature is less than 60 deg F.

I. Hot-Gas Reheat: Reheat valve diverts refrigerant hot gas to reheat coil when remote humidistat calls for dehumidification.

J. Filters: Disposable, glass-fiber or pleated, 1 inch thick, with adhesive, shall have minimum efficiency reporting value (MERV) of 5.

K. Controls:
   1. Basic Unit Controls:
      a. Low- and high-voltage protection.
      b. Overcurrent protection for compressor and fan motor.
      c. Random time delay, three to ten seconds, start on power up.
      d. Time delay override for servicing.
      e. Control voltage transformer.
   2. Thermostat:
      a. Wall-Mounted Thermostat: Honeywell VIsionPRO 8000

L. Electrical Connection: Single electrical connection with fused disconnect.

2.3 ROOFTOP WATER-SOURCE HEAT PUMPS

A. Approved Manufacturers:
   1. American Standard
2. Trane.

B. Description: Packaged water-source heat pump with temperature controls; factory assembled, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Galvanized-steel casing with the following features:
1. Water- and air-tight access panels for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.
3. Flanged duct connections.
4. Cabinet Insulation: Glass-fiber liner, 1 inch thick, complying with UL 181.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Indoor Fan: Forward curved centrifugal, with [direct-drive, multispeed motor resiliently mounted in fan inlet] [or] [belt-drive, single-speed motor with adjustable motor sheave installed on an adjustable fan base resiliently mounted in cabinet].
1. General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Direct-Drive Fan Motor: Multispeed, permanently lubricated motor.

E. Water Circuit:
1. Refrigerant-to-Water Heat Exchanger:
   a. [Coaxial] [Coil-in-shell] [Shell-and-tube] heat exchanger with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.
2. Motorized Water Valve: Stop water flow through the unit when compressor is off.

F. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:
1. Sealed Refrigerant Circuit: Minimum of 2 circuits required for units 10 tons and larger. Intertwine circuits in refrigerant to air coil.
   a. Charge with R-407C or R-410A refrigerant.
2. Charging Connections: Service fittings on suction and liquid for charging and testing on each circuit.
3. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
4. Compressor: [Hermetic-reciprocating] [Hermetic scroll] [Semihermetic reciprocating] compressor installed on vibration isolators housed in an acoustically treated enclosure with factory-installed safeties as follows:
   a. Anticycle timer.
   b. High-pressure cutout.
   c. Low-pressure cutout or loss of charge switch.
d. Internal thermal-overload protection.
e. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 35 deg F.
f. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.


8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 25 to 125 deg F.


H. Electric Heating Coil: Helix-wound, nickel-chromium wire-heating elements in ceramic insulators mounted on steel supports. Energize on call for heating when entering-water-loop temperature is less than 60 deg F.

I. Hot-Gas Reheat: Reheat valve diverts refrigerant hot gas to reheat coil when remote humidistat calls for dehumidification.

J. Hot-Gas Bypass: Include constant pressure expansion valve, solenoid valve, and controls to maintain continuous refrigeration system operation at 10 percent of full load on lead compressor.

K. Outdoor-Air Damper: Linked damper blades, for minimum 25 percent outdoor air, with [manual slide and] [fully modulating, spring-return damper motor and] hood.

L. Air-Side Economizer: Return-, relief-, and outdoor-air dampers with neoprene seals and with weather-resistant hood.

1. Damper Motors: Fully modulating spring return with adjustable minimum position potentiometer.

2. Temperature Control: Microprocessor-based controller using [outdoor-air, mixed-air and outdoor-air temperature] [outdoor-air, mixed-air temperature and selects between outdoor-air and return-air enthalpy] to adjust mixing dampers with water-loop entering temperature greater than [70 deg F] <Insert temperature>. Delay opening outdoor-air damper to minimum position until room thermostat is satisfied at room set-point temperature.

3. Ventilation Control: Provide carbon dioxide sensor to reset minimum outdoor-air intake rate to minimum 10 percent to maintain maximum 800 ppm concentration of carbon dioxide in return air.

4. Relief Damper: Gravity-actuated damper with bird screen and hood.

M. Filters: Disposable, glass-fiber or pleated type, 1 inch thick, with adhesive, shall have minimum MERV of 5.
N. Roof Curb: Steel, with corrosion-protection coating, gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14 inches.

O. Horizontal Discharge Roof Curb: Steel, with corrosion-protection coating, gasketing, and factory-installed wood nailer, and configured to convert from downflow to horizontal airflow; complying with NRCA standards; minimum height of 26 inches.

P. Isolation Curb: Rigid upper and lower steel structure with vibration isolation springs having 2-inch static deflection and vertical and horizontal restraints; with elastomeric waterproof membrane.

Q. Controls:
   1. Basic Unit Controls:
      a. Low- and high-voltage protection.
      b. Overcurrent protection for compressor and fan motor.
      c. Random time delay, three to ten seconds, start on power-up.
      d. Time delay override for servicing.
      e. Control voltage transformer.
   1. Thermostat:
      a. Wall-Mounted Thermostat: Honeywell VIsionPRO 8000

R. Electrical Connection: Single electrical connection with fused disconnect.

2.4 HOSE KITS

A. General: Hose kits shall be designed for minimum 400 psig working pressure, and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.

B. Hose: Minimum diameter, equal to water-source heat-pump connection size.

C. Isolation Valves: Two-piece bronze-body ball valves with stainless-steel ball and stem and galvanized-steel lever handle. Provide valve for supply and return. If balancing device is combination shutoff type with memory stop, the isolation valve may be omitted on the return.

D. Strainer: Y-type with blowdown valve in supply connection.

E. Balancing Device: Mount in return connection. Include meter ports to allow flow measurement with differential pressure gage.
   1. Automatic balancing valve, factory set to operate within 10 percent of design flow rate over a 40:1 differential pressure range of 2 to 80 psig.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting: Install water-source heat pumps on cast-in-place concrete equipment base(s).
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct bases to withstand, without damage to equipment, seismic force required by code.
   3. Construct concrete bases 4 inches high and extend base not less than 6 inches in all directions beyond the maximum dimensions of water-source heat pump unless otherwise indicated or unless required for seismic anchor support.
   4. Minimum Compressive Strength: 3000 psi at 28 days.
   5. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   6. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
   7. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   8. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Equipment Mounting: Install water-source heat pumps using elastomeric pads or as shown in the drawings.

C. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "The NRCA Roofing and Waterproofing Manual, Fifth Edition." Install and secure water-source heat pumps on curbs, and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts as shown in the drawings.

D. Unit Support: Install water-source heat pumps level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts or as shown on drawings.

A. Isolation Curb Support: Install water-source heat pumps on isolation curbs, and install flexible duct connectors and vibration isolation and seismic-control devices.
   1. Comply with requirements in Division 23 Section "Air Duct Accessories" for flexible duct connectors.
   2. Comply with requirements in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation and seismic-control devices.

VER: 02/11
B. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
   1. Connect supply and return hydronic piping to heat pump as shown in the drawings.
   2. Connect heat-pump condensate drain pan to indirect waste connection with condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

C. Duct installation requirements are specified in other Sections.

D. Install piping adjacent to machine to allow service and maintenance.

3.2 QUALITY CONTROL

A. Complete the manufacturer’s installation and startup checklists and resolve all discrepancies.

B. Provide the Commission Agent and SRP PM with the completed checklists/test results.

3.3 TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION