

SECTION 23 8149
WATER-TO-WATER HEAT PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water-source water-to-water heat pump for installation in conjunction with hydronic HVAC system.
- B. Circulator pump for source-side piping loop.
- C. Circulator pump for load-side piping loop.

1.02 RELATED REQUIREMENTS

- A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 0923 - Direct-Digital Control System for HVAC: HVAC controls.
- C. Section 23 2113 - Hydronic Piping: Load-side piping.
- D. Section 23 2113 - Hydronic Piping: Connections to ground loop heat exchanger.
- E. Section 23 2114 - Hydronic Specialties: Valves, strainers, and other hydronic piping specialties.
- F. Section 23 2123 - Hydronic Pumps: Load-side loop circulating pump(s).
- G. Section 23 2123 - Hydronic Pumps: Source-side loop circulating pump(s).
- H. Section 26 2717 - Equipment Wiring.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets for each product furnished, including:
 - 1. Electrical and performance data showing compliance with specifications.
 - 2. Required water flow rates and temperatures for inflow and outflow.
 - 3. Detailed electrical wiring diagrams.
 - 4. Storage and handling requirements and recommendations.
 - 5. Installation instructions.
 - 6. Start-up, troubleshooting, and TAB instructions.
 - 7. Specimen warranty.
- C. Shop Drawings: Show piping connections and interface to source-side and load-side piping, circulator pumps, and condensate drains. Include control wiring diagrams prepared specifically for this project, showing interface to space temperature control systems.
- D. Field Test Reports.
- E. Operation and Maintenance Data: Include replaceable parts lists, parts sources, and troubleshooting guide.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of the type this section and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Verify upon delivery that equipment nameplate data, including electrical data, matches specified and ordered equipment. Verify that refrigerant charge has been retained during shipping.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store products under cover and elevated above grade.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Water-to-Water Heat Pumps:
 - 1. Carrier Corporation; _____: www.carrier.com.
 - 2. Daikin Applied; _____: www.daikinapplied.com.
 - 3. Trane Inc; _____: www.trane.com.

2.02 HEAT PUMPS

- A. Heat Pumps: Factory-assembled water-source water-to-water heat pump; unit comprised of but not limited to the following components: compressor, reversing valve, refrigerant thermal expansion valve, refrigerant-to-water condensing coil, refrigerant-to-water evaporator coil, motors, hoses, controls, and internal wiring.
 - 1. Water Source: Existing ground-coupled heat exchanger.
 - 2. Leaving Water Temperature Range: Provide units capable of producing water temperature up to 130 degrees F and down to 25 degrees F.
 - 3. Certification: Provide units listed by ETL, UL, or CSA.
 - 4. Water Connections: 1 inch NPT with gaskets.
 - 5. Labels: Prominently located permanent label showing equipment characteristics; include instructional and warning labels inside cabinet or cabinet covers.
 - 6. Equipment of sizes larger than indicated, requiring additional electrical service, larger sized piping or pumps, or other modifications, is not acceptable.
- B. Energy Efficiency Ratio:
- C. Cabinet: Manufacturer's standard galvanized steel cabinet finished with appliance-grade corrosion resistant epoxy, acrylic lacquer, or electrostatic powder coating, with removable cover or access panels for inspection and access to internal parts.
 - 1. Cabinet Insulation: Minimum 1/2 inch 1-1/2 pcf density fiberglass insulation.
 - 2. Pipe Connections: Copper or stainless steel female threaded pipe connections mechanically fastened to the cabinet.
 - 3. Low Temperature Pipe, Tubing, and Heat Exchangers: Insulated with elastomeric insulation having flame spread index less than 25 and smoke developed index of less than 50, when tested in accordance with ASTM E84; and UL 94 rated.
- D. Compressor: Hermetically sealed scroll type compressor with internal vibration isolation, installed on vibration isolators inside cabinet.
- E. Refrigeration Circuits: Copper refrigerant piping, liquid line service valve, suction line service valve, full charge of compressor oil, holding charge of refrigerant; thermostatic expansion valves for refrigerant metering, and solenoid activated refrigerant reversing valves energized only during the cooling mode and designed to fail in the heating position.
- F. Refrigerant-to-Water Heat Exchangers: Coaxial (tube-within-a-tube) or brazed plate type, tested and rated for 450 psi refrigerant working pressure.
 - 1. Coaxial Heat Exchangers: Inner copper water tube and outer steel refrigerant tube.
 - 2. Brazed Plate Heat Exchangers: Stainless steel, with bi-directional liquid line filter drier.
- G. Control Components: 24 V AC electromechanical controls, factory wired and mounted in control box in cabinet; provide controllers and contactors for maximum of 120-volt control circuits and auxiliary contacts for use with controls furnished.

1. Start capacitor.
 2. Motor thermal overload protection.
 3. High and low voltage protection.
 4. Factory-installed low voltage transformer.
 5. Low voltage terminal block, with open contacts for field control wiring.
- H. Control Functions: Provide operational sequencing controls and compressor lockout relay with capability to reset at the remote thermostat and at the disconnect.
1. Lockout Relay: Triggered by the following:
 - a. High and low refrigerant pressure compressor shut-offs.
 - b. Freezestat: Low water temperature compressor shut-off, set at 35 degrees F.
 2. Provide source loop pump start/stop coordination.
 3. Random start relay.
 4. Night setback relay.
 5. Anti-short cycle timer.
- I. Vibration Isolation Pad: Mineral fiber pad between equipment and substrate.

2.03 PIPING SPECIALTIES

- A. Circulator Pumps: Provided by heat pump manufacturer; factory designed, assembled, and pressure tested.
1. Configuration: One pump in each unit.
 2. Pumps: Cast iron casings, thermally insulated.
 3. Provide brass fill and purge valves, quick release fill and purge ports, pressure/temperature (Pete's) plug, wiring, and fuse protection.
 4. Provide manufacturer's standard galvanized steel cabinet, finished with corrosion resistant epoxy paint.
 5. Electrical Characteristics:
 6. Efficiency:
 7. Capacity - Source Side: 20 gpm, minimum.
 8. Capacity - Load Side: 20 gpm, minimum.
- B. Flexible Pipe Connections: Braided stainless steel hoses with swivel connectors; UL 94 rated.
1. Minimum Working Pressure: 300 psi.
 2. Length: 2 feet, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that power supply complies with equipment specifications.
- B. Verify that all connections for water and electricity are available, operational, and placed correctly for unit installation.
- C. Verify that equipment is undamaged, including refrigerant components and valves and electrical connections.
- D. Verify that substrates are sound and ready for installation.
- E. Do not begin installation until installation sites have been properly prepared. If installation site preparation, such as the water source, is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

3.03 INSTALLATION

- A. Install equipment in accordance with the manufacturer's written installation instructions.
- B. Do not obstruct maintenance access to equipment by any type of piping, electrical conduit, or any other utility.
- C. Flush and clean piping before placing in operation; take precautions to prevent introduction of debris into piping systems.
- D. Connections to Existing Systems: Obtain approval before interrupting service; notify the Architect in writing at least 15 calendar days prior to the date the connections are required.
- E. Start system and adjust controls and equipment so as to give satisfactory operation.
- F. Adjust water temperature control system and place in operation so that water quantities circulated are as required.

3.04 FIELD QUALITY CONTROL

- A. Upon completion and before final acceptance of work, test each system to demonstrate compliance with the contract requirements.
 - 1. Adjust controls and balance systems prior to final acceptance of completed systems.
 - 2. Test controls through every cycle of operation.
 - 3. Test safety controls to demonstrate performance of required function.
 - 4. Furnish water, electricity, instruments, connecting devices, and personnel for tests.
 - 5. Clean equipment, piping, strainers, ducts, and filters.
 - 6. Coordinate testing with testing of related piping, specified elsewhere.
 - 7. Correct defects in work and repeat tests.
- B. Operational Testing: After demonstration of satisfactory operation perform operational testing:
 - 1. Test each item of equipment in operation for continuous period of not less than 24 hours under every condition of operation in accordance with equipment manufacturer's recommendations.
 - 2. Verify that each item of equipment operating parameters are within limits recommended by the manufacturer.
 - 3. Manufacturer's Recommended Test: Conduct the manufacturer's recommended field testing; furnish a factory trained field representative authorized by and to represent the equipment manufacturer during the complete execution of the field testing.
- C. Additional requirements for testing, adjusting, and balancing (TAB) of piping, equipment, and controls are specified in Section 23 0593.
- D. Within 30 calendar days after acceptable completion of testing, submit each test report for review and approval; include:
 - 1. Unit nameplate data, and actual voltage and ampere consumption.
 - 2. Load-side supply and return water flow and temperatures, and measurement equipment.
 - 3. Source-side supply and return water flow and temperatures, and measurement equipment.
 - 4. Ambient air temperature at heat pump unit.
 - 5. Date and name and signature of person testing and reporting.

3.05 CLOSEOUT ACTIVITIES

- A. Training: Upon completion of work and at time designated by Architect, provide services of water source heat pump manufacturer's technical representative for period of not less than one 8-hour working day for instruction of Owner operating personnel in proper operation and maintenance of equipment.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 23 8149