

## **SECTION 22 35 00 - DOMESTIC WATER HEAT EXCHANGERS**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Plate and frame domestic-water heat exchangers.
  - 2. Domestic-water, heat-exchanger accessories.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type and size of domestic-water heat exchanger indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Retain paragraph below if equipment includes wiring.
- C. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of plate and frame domestic-water heat exchanger, from manufacturer.
- B. Domestic-Water, Heat-Exchanger Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For domestic-water heat exchangers to include in emergency, operation, and maintenance manuals.

## **1.6 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label heat-exchanger storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

## **1.7 COORDINATION**

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

## **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of domestic-water heat exchangers that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including heat exchanger, storage tank, and supports.
    - b. Faulty operation of controls.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  - 2. Warranty Periods: From date of Substantial Completion.
    - a. Plate and frame, Domestic-Water Heat Exchangers:
      - 1) Main heat exchanger: One year(s).
      - 2) Controls and Other Components: One year(s).
    - b. Compression Tanks: One year(s).

## **PART 2 – PRODUCTS**

### **2.1 DESIGN & CONSTRUCTION**

- A. Each heater shall be of the counter-current flow stainless steel brazed plate heat exchanger designed and manufactured in accordance with ASME Code Section VIII, Div. 1 for 435 psig @ 300°F. The packaged heater shall be rated for not less than 150 psig on the service water side and not less than 150 PSIG, 220°F on the boiler water side. The plates shall be 316L stainless steel, brazed together using copper.

### **2.2 ELECTRONIC CONTROL SYSTEM:**

- A. The heater shall maintain +/- 2°F Max temperature fluctuation from temperature setpoint at 0% to 100 % load at a constant load and +/- 4°F under normal diversified domestic load conditions. The system shall consist of a 3-way electronic control valve, constant speed domestic water circulator pump, control panel enclosure housing a PID temperature controller with digital indication of shell outlet water temperature, boiler water inlet and boiler water outlet temperatures, digital over-temperature limit switch, and feed-forward and feedback temperature sensors. The controller shall close the control valve in an over-temperature condition. The system shall have the following additional characteristics:
1. Controller temperature setpoint range between 50°F to 180°F maximum
  2. Configured for 120V/1-phase/60Hz and 220V/1-phase/50Hz
  3. Easy start-up by dialing in setpoint.
- B. The electronic control valve shall be of equal percentage flow characteristics, and has a tight shut-off with low leakage rate of .02% of its Cv value. The valve shall have the following performance characteristics:
1. 1000 to 1 Turndown.
  2. Magnetic Actuator with Fail Closed Design-particularly on loss of power
  3. Time to Full Open Position: 2 seconds
  4. Time to Full Closed Position: 2 seconds
- C. The PID temperature controller shall incorporate a feed-forward function and be password protected. The controller shall be capable of remote communications via an optional add-in board that incorporates either: an RS-232 port or an RS-485 port & utilizes the MODBUS protocol for interoperability with Building Automation Systems (BAS).
- D. Controls interface with BACnet shall utilize an optional AERCO Communications Gateway to act as a MODBUS interface/translator between the BAS and the MODBUS port of the temperature controller. The AERCO Communications Gateway shall be comprised of a microprocessor based control utilizing the MODBUS protocol to communicate with the temperature controller.

Non-volatile backup of all point mappings and programs shall be internally provided as standard. Connection between Gateway and individual water heaters shall be "daisy chain" with shielded, twisted pair, low voltage wiring for ease of installation.

- E. The following information shall be accessible locally at the controller or remotely via the communications port:
1. Setpoint – can be changed remotely
  2. Outlet Temperature
  3. Over Temperature Alarm
  4. Control Output Signal to valve
- F. Each heater shall be supplied by the manufacturer ready to accept existing boiler water and domestic water lines, and furnished with the following accessories:
1. Y-strainers with blowdown valve for boiler water and domestic water.
  2. Boiler water strainer differential pressure gauge.
  3. Bronze T & P relief valve, conforming to ANZI Z21.22, set at 150 PSIG/210°F
  4. Bronze ball type isolation valves.
  5. 3/4" Bronze domestic water drain valve.
  6. Domestic water Air Vent.
  7. In-place connections for easy and simple cleaning of the brazed plate heat exchanger.
  8. Warranty: The heater shall carry the following manufacturer's warranty. The Heat Exchanger and all accessories shall carry an 18-month guarantee against mechanical failure or workmanship from the date of Owner Acceptance.

## 2.3 DOMESTIC-WATER, HEAT-EXCHANGER ACCESSORIES

- A. Domestic-Water Compression Tanks:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AERCO
    - b. AMTROL Inc.
    - c. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
    - d. State Industries.

- e. Taco, Inc.
- 2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
- 3. Construction:
  - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
  - b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
  - c. Air-Charging Valve: Factory installed.
- 4. Capacity and Characteristics:
  - a. Working-Pressure Rating: 150 psig (1035 kPa).
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- C. Heat-Trap Fittings: ASHRAE 90.2.
- D. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than heat-exchanger working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- E. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

## **2.4 SOURCE QUALITY CONTROL**

- A. Factory Tests: Test and inspect domestic-water heat exchangers specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heat exchangers to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heat exchangers will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 221116 "Domestic Water Piping" for retesting and reinspecting requirements.
- D. Prepare test and inspection reports.

## **PART 3 - EXECUTION**

### **3.1 DOMESTIC-WATER, HEAT-EXCHANGER INSTALLATION**

- A. Domestic-Water, Heat-Exchanger Mounting: Install domestic-water heat exchangers on concrete base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  5. Anchor heat exchangers to substrate.
- B. Install domestic-water heat exchangers level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
1. Install shutoff valves on domestic-water-supply piping to heat exchangers and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
  2. Install shutoff valves on heating hot-water piping to heat exchangers. Comply with requirements for shutoff valves specified in Section 230523 "General-Duty Valves for HVAC Piping."
- C. Install temperature and pressure relief valves in top portion of storage-tank shells of domestic-water heat exchangers with domestic-water storage. Use relief valves with sensing elements that extend into shells. Extend relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install combination temperature-and-pressure relief valves in water piping for domestic-water heat exchangers without storage. Extend relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install heat-exchanger drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heat exchangers that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Install thermometer on each domestic-water, heat-exchanger, inlet and outlet piping, and install thermometer on each domestic-water, heat-exchanger, heating-fluid inlet and outlet piping. Comply with requirements for thermometers specified in Section 220519 "Thermometers and Gages for Plumbing Piping."
- G. Install pressure gages on domestic-water, heat-exchanger, heating-fluid piping. Comply with requirements for pressure gages specified in Section 220519 "Thermometers and Gages for Plumbing Piping." Install Dwyer series DX differential pressure switch to monitor pressure drop across strainer.

- H. Fill domestic-water heat exchangers with water.
- I. Charge domestic-water compression tanks with air.

### **3.2 CONNECTIONS**

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for heating hot-water piping specified in Section 232113 "Hydronic Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to domestic-water heat exchangers, allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of domestic-water heat exchangers.

### **3.3 IDENTIFICATION**

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### **3.4 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heat exchangers will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 221116 "Domestic Water Piping" for retesting and reinspecting requirements.
- C. Prepare test and inspection reports.

### **3.5 DEMONSTRATION**

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

### **END OF SECTION**

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