

SECTION 223500 - 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. This Section includes the following heat exchangers:
 - 1. Instantaneous heat exchangers.
 - 2. Compression tanks.
 - 3. Heat-exchanger accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and size of heat exchanger indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Product Certificates: For each type of instantaneous heat exchanger, signed by product manufacturer.
- C. Source quality-control test reports.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.
- F. Warranties: Submit written special warranty as specified in this Section. Include contact information, description of coverage, and start date for each special warranty..

1.4 QUALITY ASSURANCE

- A. 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.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with water.
- C. Permits and Inspections

1. The Plumbing or Mechanical Contractor shall obtain and pay for all permits required by the State of Michigan Department of Licensing and Regulatory Affairs, Boiler Division.
2. The boiler inspection certificate will be issued directly to the Owner by the Boiler Division, State of Michigan, after all required electrical, mechanical and plumbing permits have had a final inspection approval.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of heat exchangers that fail 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 Period(s): From date of Substantial Completion:
 - a. Instantaneous Heat Exchangers:
 - 1) Tube Coil and Shell: One year.
 - 2) Controls and Other Components: One year.
 - b. Compression Tanks: One year.

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 INSTANTANEOUS HEAT EXCHANGERS

- A. Heating-Fluid-in-U-Tube-Coil, Instantaneous Heat Exchangers:

1. Manufacturers:
 - a. Armstrong International, Inc.
 - b. Cemline Corporation: Model SEH
 - c. Patterson-Kelley; PK Compact.
 - d. RECO USA; Model Thermo-Dyne
2. Description: Tankless, packaged assembly of heat-exchanger coil, controls, and specialties for heating domestic water in shell with steam in coil.
3. Construction: ASME-code, negligible-capacity, copper-lined, carbon-steel or copper-alloy shell with 150-psig (1035 kPa) minimum working-pressure rating.
 - a. Configuration: Vertical.
 - b. Shell Tappings: Factory fabricated of materials compatible with water heater shell. Attach tappings to shell before testing and labeling.
 - 1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
 - c. Insulation: Complying with ASHRAE/IESNA 90.1, unless otherwise indicated, and suitable for operating temperature. Surround entire shell and nozzle except connections and controls.
 - d. Heat-Exchanger Coil: 90/10 Copper-Nickel, single-wall, U tubes for heating fluid.
 - 1) Tube Pressure Rating: Equal to or greater than heating-fluid supply pressure.
4. Temperature Control: Adjustable thermostat that operates steam-control valve and that is capable of maintaining outlet-water temperature within 5 deg F (3 degree C) of setting.

Two control valves, connected in a 1/3 and 2/3 sequence shall be installed on heaters with a rated capacity of 200 gpm or greater.

- a. Steam control valve: Equal to Siemens Flowrite 599 Series Globe, iron body, stainless steel trim, linear flow characteristic, 2-way normally closed with minimum 30 psi close-off pressure electronic actuator.
 - b. Anticipator control: Equal to Powers Accritem #744-1214 with a range of 50 degree F. to 350 degree F
5. Safety Control: Automatic, high-temperature-limit cutoff device or system.
 6. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of heat exchanger. Select one relief valve with sensing element that extends into shell.
 7. Miscellaneous Components for Steam Unit: Strainers, steam-control valve, steam trap, valves, pressure gage, thermometer, and piping.
 8. Stand: Factory fabricated for floor mounting.

2.3 COMPRESSION TANKS

Retain this Article only if small, non-ASME-code, diaphragm tanks with a capacity of 25 gal. (95 L) or less are required. Small tanks are usually available with 150-psig (1035-kPa) working-pressure rating. Large tanks are usually available with only 100-psig (690-kPa) working-pressure rating. A multiple, small-tank arrangement may be used to match system pressure and volume requirements. Other compression tanks are specified in Division 22 Section "Facility Indoor Potable-Water Storage Tanks."

- A. 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.
 - 1. Manufacturers:
 - a. AMTROL Inc.
 - b. Armstrong Pumps, Inc.
 - c. Smith, A. O.; Aqua-Air Div.
 - d. Taco, Inc.
 - e. Watts Regulator Co.
 - 2. 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.
 - 3. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig (1035 kPa).

2.4 HEAT-EXCHANGER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of heat exchanger. Select relief valves with sensing element that extends into heat-exchanger storage tank.
- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than working-pressure rating of heat exchanger.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect heat-exchanger storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial heat-exchanger storage tanks before shipment to minimum of one and one-half times pressure rating.

- C. Prepare test reports.

PART 3 - EXECUTION

3.1 HEAT-EXCHANGER INSTALLATION

- A. Install heat exchangers on concrete bases.
 - 1. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install 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.
- C. Anchor heat exchangers to substrate.
- D. Install temperature and pressure relief valves in top portion of storage tank shells of 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 water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install combination temperature and pressure relief valves in water piping for heat exchangers without storage. Extend relief-valve outlet, with drain piping same as water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. 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 heat exchangers that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- G. Install thermometer on each heat-exchanger domestic-water inlet and outlet piping, and install thermometer on each heat-exchanger heating-fluid inlet and outlet piping. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- H. Install pressure gages on heat-exchanger heating-fluid piping. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to heat exchangers to allow service and maintenance. Arrange piping for easy removal of heat exchangers.
- C. Connect hot and cold water piping to unit with shutoff valves and unions.

- D. Connect re-circulating hot water piping to unit with shutoff valve, check valve and union.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace heat exchangers that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 223500