

## **SECTION 235700 – HEAT EXCHANGERS**

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(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 23.

#### **1.2 SUMMARY**

- A. This section includes the requirements for heat exchangers for HVAC systems using the following: **<Edit for project.>**
  - 1. Shell and tube heat exchanges.
  - 2. Plate heat exchangers.
  - 3. Accessories.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, rated capacities, performance data, specialties, accessories, installation instructions, specified options, and warranty information.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints and for designing bases.
  - 2. Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

- C. Delegated Design Submittal: Details and design calculations for seismic restraints for heat exchangers.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Tube removal space.
  2. Structural members to which heat exchangers will be attached.
- B. Seismic Qualification Certificates: For heat exchanger, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Heat Exchanger: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of heat exchanger anchorage devices on which certification is based and their installation requirements.
- C. Product Certificates: For each type of shell and tube heat exchanger. Documentation that shell and tube heat exchangers comply with "TEMA Standards."
- D. Source quality-control reports.
- E. Field quality control reports.
- F. Sample Warranty: For manufacturer's warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include a copy of each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.

#### 1.6 WARRANTY/GUARANTEE

- A. See Division 23 Specification Section "Basic Mechanical Requirements – HVAC" for warranty and guarantee requirements.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of heat exchanger's 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.

## PART 2 - PRODUCTS

### 2.1 GENERAL PRODUCT REQUIREMENTS

- A. Equipment Design and Selection: Heat exchangers and specialties shall be designed and selected, for the intended use, in accordance with the scheduled capacities on the drawings and the requirements of this specification.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide heat exchangers by one (1) of the following:
  1. Shell and Tube Heat Exchanger:
    - a. Taco Incorporated.
    - b. Bell & Gossett Pumps, ITT Corporation
    - c. Armstrong Pumps
    - d. Dunham Bush Inc.
  2. Gasketed Plate Heat Exchanger:
    - a. Baltimore Air Coil.
    - b. Alfa Laval.
    - c. Tranter Company.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Heat exchangers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. <Edit for project.>
  1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  2. Component Importance Factor is [1.5] [1.0]. <Edit for project.>

## 2.3 SHELL AND TUBE HEAT EXCHANGERS

- A. Description: Packaged assembly of tank, heat exchanger coils, and specialties.
- B. Construction:
  1. Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 01.
  2. Fabricate and label shell and tube heat exchangers to comply with "TEMA Standards."
- C. Configuration: [U tube with removable] [Straight tube with removable] [Straight tube with fixed] bundle. <Edit for project.>
- D. Shell Materials: Steel.
- E. Head:
  1. Materials: Fabricated steel.

2. Flanged and bolted to shell.

F. Tube:

1. Seamless copper tubes.
2. Tube diameter is determined by manufacturer based on service.

G. Tube Sheet Materials: Steel.

H. Baffles: Steel.

I. Piping Connections: Factory fabricated of materials compatible with heat exchanger shell. Attach tappings to shell before testing and labeling.

1. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
2. NPS 2-1/2 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.

J. Support Saddles:

1. Fabricated of material similar to shell.
2. Fabricate foot mount with provision for anchoring to support.
3. Fabricate attachment of saddle supports to pressure vessel with reinforcement strong enough to resist heat exchanger movement during seismic event when heat exchanger saddles are anchored to building structure.

## 2.4 GASKETED-PLATE HEAT EXCHANGERS

A. Configuration: Freestanding assembly consisting of frame support, top and bottom carrying and guide bars, fixed and movable end plates, tie rods, individually removable plates, and one piece gaskets.

B. Construction: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 01.

C. Frame:

1. Capacity to accommodate 20% additional plates.
2. Painted carbon steel with provisions for anchoring to support.

D. Top and Bottom Carrying and Guide Bars: Painted carbon steel, aluminum, or stainless steel.

1. Fabricate attachment of heat exchanger carrying and guide bars with reinforcement strong enough to resist heat exchanger movement during seismic

event when heat exchanger carrying and guide bars are anchored to building structure.

- E. End Plate Material: Painted carbon steel.
- F. Tie Rods and Nuts: Steel or stainless steel.
- G. Plate Material: 0.024 inch thick before stamping; Type 304 stainless steel.
- H. Gasket Materials: Glued Nitrile rubber.
  - 1. Glue: Chlorine free.
- I. Piping Connections: Factory fabricated of materials compatible with heat exchanger shell. Attach tappings to shell before testing and labeling.
  - 1. NPS Two (2) Inch and Smaller: Threaded ends according to ASME B1.20.1.
  - 2. NPS Two and One Half (2-1/2) Inch 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.
- J. Enclose plates in solid aluminum removable shroud.

## 2.5 ACCESSORIES

- A. Hangers and Supports:
  - 1. Factory fabricated steel supports or cradles to ensure both horizontal and vertical support of heat exchanger. Comply with requirements in Division 23 Specification Section "Hangers and Supports for HVAC Piping Systems.
- B. Shroud: Steel sheet.

## 2.6 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect heat exchangers according to ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 01. Affix ASME label.
- B. Hydrostatically test heat exchangers to minimum of one and one-half (1-1/2) times pressure rating before shipment.
- C. Heat exchangers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
- B. Examine roughing in for heat exchanger piping to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 SHELL AND TUBE HEAT EXCHANGER INSTALLATION**

- A. Equipment Mounting:
  - 1. Install heat exchangers on cast in place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Architectural Specification Sections "Cast in Place Concrete." and "Miscellaneous Cast in Place Concrete."
  - 2. Comply with requirements for vibration isolation and seismic control devices specified in Division 23 Specification Section "Vibration and Seismic Controls for HVAC Systems."
- B. Install heat exchangers on saddle supports.
- C. Heat Exchanger Supports: Use factory fabricated steel cradles and supports specifically designed for each heat exchanger.

### **3.3 GASKETED PLATE HEAT EXCHANGER INSTALLATION**

- A. Install gasketed plate heat exchanger on custom designed wall supports anchored to structure as indicated on Drawings.
- B. Install metal shroud over installed gasketed plate heat exchanger according to manufacturer's written instructions.

### **3.4 CONNECTIONS**

- A. Comply with requirements for piping specified in other Division 23 Specification Section "HVAC Piping Systems and Specialties". Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Maintain manufacturer's recommended clearances for tube removal, service, and maintenance.

- C. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.
- D. Install shutoff valves at heat exchanger inlet and outlet connections.
- E. Install relief valves on heat exchanger heated fluid connection and install pipe relief valves, full size of valve connection, to floor drain.
- F. Install vacuum breaker at heat exchanger steam inlet connection.
- G. Install hose end valve to drain shell.
- H. Install thermometer on heat exchanger and inlet and outlet piping, and install thermometer on heating fluid inlet and outlet piping. Comply with requirements for thermometers specified in Division 23 Specification Section "Meters and Gauges for HVAC Piping."
- I. Install pressure gages on heat exchanger and heating-fluid piping. Comply with requirements for pressure gages specified in Division 23 Specification Section "Meters and Gauges for HVAC Piping."

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Heat exchanger will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.6 CLEANING

- A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

### 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers.

END OF SECTION 235700