

## SECTION 23 05 19 HYDRONIC SPECIALTIES

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. This section includes requirements for:
1. Steam-to-water heat exchanger
  2. Compression tank
  3. Pressurized expansion tanks
  4. Tank air control fittings
  5. Tangential air separator
  6. Boiler dip tube fittings
  7. Suction diffuser
  8. P.T. test plugs
  9. Pressure test kit
  10. Pressure gauges
  11. Thermometers
  12. Thermometer test wells
  13. Hydronic pressure reducing valves
  14. Relief valves
  15. Triple duty valves
  16. Auto-flow balancing valves.
  17. Flow measure station
  18. Flow balancing valve
  19. Flow measuring meter
  20. Strainers.
  21. Annubar flow sensor and meter

#### 1.02 RELATED WORK

- A. Section 23 20 00: HVAC Piping
- B. Section 23 21 23: HVAC Pumps

#### 1.03 SUBMITTALS

- A. Submit product data for review including:
1. Steam-to-water heat exchanger
  2. Compression tank
  3. Pressurized expansion tanks
  4. Tank air control fitting
  5. Tangential air separator
  6. Suction diffuser
  7. Triple duty valve
  8. Flow measuring station
  9. Auto Flow balancing valve
  10. Flow balancing valve
  11. Flow measuring meter
  12. Annubar flow sensor and meter
  13. Pressure gauges and P.T. plugs
  14. Thermometers
  15. Strainers
  16. Relief Valves

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Bell & Gossett ITT
- B. Keckley
- C. Trerice Company
- D. Taco
- E. Thrush
- F. Wheatley
- G. Peterson Engineering
- H. Mueller
- I. Armstrong
- J. Dieterich Standard

### 2.02 STEAM-TO-WATER HEAT EXCHANGER

- A. Similar to B & G, type SU. Multi-pass, shell and tube construction with "U-bend" removable tube bundle, steam in shell, water in tubes.
- B. Tubes: Removable U-tube type bundle with minimum 3/4" OD seamless copper tubes suitable for working pressure set forth on schedules.
- C. Heads: Cast iron or steel with steel tube sheets and tube supports.
- D. Construction standards: ASME code for Unfired Pressure Vessels. Stamp unit and furnish with Form U-1 denoting compliance with ASME.
- E. Mounting: Steel saddle and attaching U-bolts.
- F. Water side connections: Flanged

### 2.03 COMPRESSION TANK

- A. Material: Carbon steel.
- B. Construction standard: ASME Boiler and Pressure Vessel Code.
- C. Working Pressure: As shown on drawings.
- D. Stamp tanks with ASME "U" symbol and furnish with Form U-1 denoting compliance with ASME Unfired Pressure Vessel Code.
- E. Provide mounting saddles.
- F. Sight glass: Provide glass tapings and sight glass to indicate water level in tank.

#### 2.04 PRESSURIZED EXPANSION TANK

- A. Shell Material: Carbon steel.
- B. Diaphragm: Heavy duty butyl rubber.
- C. Construction standard: ASME Section VIII, Division 01.
- D. Maximum Design Pressure: 125 PSI, ASME Stamped.
- E. Working Pressure: As shown on drawings.
- F. Capacity: Provide tanks for horizontal or vertical mounting with capacity and size as indicated on Drawings.
- G. Connections: Provide system connection opening in tank and .302"-32 charging valve connection to facilitate on-site charging of the tank to meet system requirements.
- H. Sight Glass: Provide sight glass to indicate water level in tank.

#### 2.05 TANK AIR CONTROL FITTINGS

- A. Furnish an air control tank fitting containing an air separating trap and water control baffle to provide unrestricted air flow to the compression tank and air-free water flow from the tank.
- B. Construction: Cast iron body and copper plated tubes.
- C. Equip fittings with manual vent tube.
- D. Construct fitting for working pressure set forth on schedules.

#### 2.06 TANGENTIAL AIR SEPARATOR

- A. Type: Similar to Bell & Gossett, Type "R".
- B. Provide an external air separation unit consisting of a steel tank, collector tube, and strainer.
- C. Connections: Screwed or flanged tangential inlet and outlet.
- D. Design internal perforated stainless air collector tube to direct released air into compression tank.
- E. Construct unit in accordance with ASME Boiler and Pressure Vessel Code and stamp for working pressure specified on schedules.
- F. Blowdown connection to facilitate routine cleaning of unit.
- G. Unit to prevent accumulation of air in hydraulic heating and/or cooling system and prevent noises caused by entrained air in piping.

#### 2.07 BOILER DIP TUBE FITTINGS

- A. Design boiler dip tube fitting to prevent free air collecting in the boiler from rising into the system.
- B. Design dip tube fitting suitable for working pressure specified on schedule.

## 2.08 SUCTION DIFFUSER

- A. Provide at each end suction pump a suction diffuser with integral strainer of size and type noted on the drawings.
- B. Construct unit of cast iron, angle type body with steel inlet vanes and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection.
- C. Equip orifice cylinder with a disposable, fine mesh strainer which shall be removed after system start-up.
- D. Design orifice cylinder to withstand pressure differential equal to pump shutoff head and have a free area equal to five times cross-sectional area of pump suction opening.
- E. Design vane length not less than 2-1/2 times the pump connection diameter.

## 2.09 P.T. TEST PLUGS

- A. Provide 1/4" solid brass pressure/temperature test plugs at locations shown on drawings.
- B. Provide N2 Nordel self-closing valve rated for 275 degrees F service.
- C. P.T. test plugs shall be installed at the following locations and elsewhere as shown on the drawings.
  - 1. Entrance and exit of building when connected to the chilled water central plant.
  - 2. At suction and discharge of pumps.
  - 3. At water inlet and outlet of heat exchanger.
  - 4. At water inlet and outlet of air handling unit coils.
  - 5. Adjacent to each pressure gauge and thermometer.

## 2.10 PRESSURE TEST KIT

- A. Provide two complete portable pressure and temperature test kit to include at least the following:
  - 1. Pressure test gauge, necessary connector hoses, temperature test thermometer with adapter, shutoff and vent valves and carrying case. Select thermometers and gauges to read mid-range at design operating temperatures and pressures where PT plugs are installed.

## 2.11 PRESSURE GAUGES

- A. Type: Round face, dial type by Trerice.
- B. Trerice 800 LF, 3-1/2" face, glycerin filled, ASME B40.1 Grade 'A' accuracy, 1% full scale.
  - 1. Constant flow primary chilled water 0-100 psi range
  - 2. Variable flow primary chilled water 0-160 psi
  - 3. Secondary chilled water 0-160 psi
  - 4. Condenser water 0-100 psi
- C. Trerice P500, 4-1/2" face, ASME B40.1 Grade 'A' accuracy, 1% full scale; stainless steel Bourdon tube for high operating Temperatures. 0-100 psi range for hot water.
  - 1. Reheat hot water - 0-100 psi
- D. Gauge cocks: Trerice model 735 needle valves.
- E. Provide Trerice model 872 snubber on all gauges.

## 2.12 THERMOMETERS

- A. Provide Trerice Model BX91403-1/2 9" scale thermometers, adjustable angle (rear, front and side), with separable brass wells at locations shown on drawings.
  - 1. Range:
    - a. Brine water: 0 degrees F. - 120 degrees F
    - b. Chilled water: 30 degrees F. - 130 degrees F
    - c. Condenser water: 30 degrees F. - 130 degrees F
    - d. Reheat hot water: 30 degrees F. - 240 degrees F
- B. Trerice P500, 4-1/2" face, ASME B40.1 Grade 'A' accuracy, 1% full scale. Stainless steel Bourdon tube for high operating temperatures. Select steam system gauges for operating pressure to be in midpoint of range. Provide coil syphon with all steam gauges.

## 2.13 THERMOMETER TEST WELLS

- A. Provide Trerice stainless steel thermometer test wells at locations shown on drawings.
- B. Provide stainless steel test wells with 2-1/2" extension neck and screw plug capped with chain and filled with light clear oil.

## 2.14 PRESSURE REDUCING VALVES

- A. Equip each valve with antisiphon check valve and removable strainer.
- B. Select reducing valve for operation at midpoint of adjustment range.
- C. Provide factory set pressure reducing valve with adjustable range.

## 2.15 RELIEF VALVES

- A. Provide relief valves for each hydronic system as shown on drawings.
- B. Construct valve to ASME requirements, tested by National Board of pressure vessels, and labeled with ASME symbol.
- C. Construct valve body of non-ferrous material.
- D. Provide diaphragm type valve operating with slow opening and closing feature.
- E. Valve to seat against face of EPDM rubber.
- F. Set differential between opening and closing pressure to prevent water flash and water hammer.
- G. Include manual lever for testing valve.

## 2.16 TRIPLE DUTY VALVES

- A. Type: Similar to Bell & Gossett No. 3DS.
- B. Provide triple duty valves as shown on the plans that incorporate non-slam, vertical lift check, calibrated balance, and positive shutoff, all in one valve.
- C. Provide valve weighted disc, hand lap seat and disc, and suitable for 300 degrees F operating temperature.

- D. Unit to be cast iron body construction, suitable for maximum working pressure as specified on drawings.

#### 2.17 FLOW MEASURING STATION

- A. Type: Similar to Bell & Gossett, Type OP.
- B. Provide orifice insert with provisions for connecting a portable differential pressure meter for flow measurement.
- C. Plate all surfaces and provide with name tags showing the capacity curve applicable to this meter.
- D. Provide brass threads on sizes 1/2" thru 2" machine 2-1/2" thru 4" for socket weld; 5" and above for butt weld.
- E. Provide meter connections with built-in check valves suitable for working pressure as specified on drawings at 250 degrees F.
- F. Provide measuring station with engraved tag attached indicating design flow, pressure, and flow characteristics of station.

#### 2.18 AUTO-FLOW BALANCE VALVE

- A. Type: Similar to Flow Design Model AC with 2-32 psi spring range.
- B. Factory set to automatically limit flow to within 5% of flow range. Pressure drop through valve shall not exceed 5 ft. for 2 inch size. Valves flow range shall be independently tested and certified by professional engineer.
- C. Provide with removable cartridge without the use of special tools or cutting piping. Provide two extended Pete ports on each valve to clear insulation.
- D. Valve shall be constructed for 400 psig design at 250 degrees F. The flow cartridge shall have stainless steel internal parts. Machined threads shall be provided to adjust cartridge height without the use of shims or crimped sheet metal. Valve body shall be brass with brass ball valve and 'O' ring type union. All valves shall be factory leak tested.
- E. Provide integral union on the downstream side of the assembly.
- F. Refer to piping details for additional information.
- G. Provide electronic pressure (0-75 psi) and temperature (-10 - 230 F) test kit.

#### 2.19 FLOW BALANCING VALVE

- A. Type: Similar to Armstrong "CBV".
- B. Provide calibrated, non-ferrous globe valve with provisions for connecting a portable differential pressure meter for flow measurement and balance. Characterized ball valves are not acceptable.
- C. Provide meter connections with built-in check valves.
- D. Provide integral pointer to register degree of valve opening with tamper proof memory feature.

- E. Provide valve with drain connection.
- F. Construct valve with integral seals to prevent leakage around rotating element.
- G. Construct valve for 125 psi working pressure at 150 degrees F.
- H. Provide preformed polyurethane insulation for easy access to valve without disturbing field applied adjacent insulation.
- I. Provide valve with engraved tag attached indicating design flow, pressure, and flow characteristic of station.

#### 2.20 FLOW MEASURING METER

- A. Type: Similar to Bell & Gossett, Model RO-5.
- B. Provide portable readout meter capable of indicating pressure differential across previously specified flow measuring devices.
- C. Provide necessary hoses, shutoff and vent valves, and carrying case.
- D. Reading range to be midscale of units to be read.

#### 2.21 WATER TO WATER PLATE/FRAME HEAT EXCHANGER

- A. Acceptable manufacturers:
  - 1. Mueller
  - 2. Alfa-Laval
  - 3. Armstrong
  - 4. Graham
- B. Materials of construction:
  - 1. Plates shall be type 304 stainless steel, with herringbone corrugations, minimum with minimum thickness of 0.5 mm.
  - 2. Gaskets shall be one piece, molded, nitrile butadiene rubber.
  - 3. Frame shall be epoxy coated carbon steel.
  - 4. Tie rods, bolts, nuts and washers shall be zinc plated steel.
  - 5. Safety shroud shall be aluminum, to meet OSHA requirements.
- C. Fabrication/assembly:
  - 1. Unit shall be designed, manufactured and tested in accordance with ASME, Section VIII for design working pressure of 100 psig. Unit shall be tested at design pressure x 1.5. Unit shall withstand full design pressure in one circuit with zero psig in opposite circuit.
  - 2. Unit shall be bolted together to allow field assembly. Exchanger shall have capacity for future addition of 20 plates.
  - 3. Provide lifting lugs capable of supporting weight of flooded unit.
  - 4. Unit shall be designed using a fouling factor of 0.001 at conditions and capacities required.
  - 5. Connections 2-1/2" and above shall be ANSI flanged; connections 2" and less shall be IPS threaded connections.

#### 2.22 ANNULAR FLOW SENSOR AND METER

- A. Provide annular primary flow element as manufactured by Dieterich Standard Corporation where shown on drawings.

- B. Include annular primary flow element station and permanently mounted indicator.
- C. Provide measuring station with safety shutoff valves and permanent coupling connections.
- D. Provide metal tag showing design flow rates, meter readings for design flow rates, meter fluid, line size, and tag and station number.
- E. Construct measuring element of stainless steel.
- F. Provide either nipple section or weld insert type, stations depending on pipe size, rated at 275 psi at 400 degrees F.
- G. Provide rotatable sensing elements allowing pressure sensing ports to be pointed downstream when station is not in use.
- H. Permanent pressure loss to system not to exceed 5" w.g.
- I. Guarantee accuracy of flow measuring element within 2% as verified by independent testing laboratory.
- J. Provide totally dry, single diaphragm type meter with 6" dial pointer indicator. Construct wetted parts of 316 stainless steel. Provide meter with variable pulsation dampening control and integral equalizing valve with two bleed valves.
- K. Furnish meter with master chart for direct conversion of meter readings to gallons per minute.

#### 2.23 WATER TO WATER PLATE/FRAME HEAT EXCHANGER

- A. Acceptable manufacturers:
  - 1. Mueller
  - 2. Alfa-Laval
  - 3. Armstrong
  - 4. Graham
- B. Materials of construction:
  - 1. Plates shall be type 304 stainless steel, with herringbone corrugations, minimum with minimum thickness of 0.5 mm.
  - 2. Gaskets shall be one piece, molded, nitrile butadiene rubber.
  - 3. Frame shall be epoxy coated carbon steel.
  - 4. Tie rods, bolts, nuts and washers shall be zinc plated steel.
  - 5. Safety shroud shall be aluminum, to meet OSHA requirements.
- C. Fabrication/assembly:
  - 1. Unit shall be designed, manufactured and tested in accordance with ASME, Section VIII for design working pressure of 100 psig. Unit shall be tested at design pressure x 1.5. Unit shall withstand full design pressure in one circuit with zero psig in opposite circuit.
  - 2. Unit shall be bolted together to allow field assembly. Exchanger shall have capacity for future addition of 20 plates.
  - 3. Provide lifting lugs capable of supporting weight of flooded unit.
  - 4. Unit shall be designed using a fouling factor of 0.001 at conditions and capacities required.
  - 5. Connections 2-1/2" and above shall be ANSI flanged; connections 2" and less shall be IPS threaded connections.

#### 2.24 STRAINERS



- A. Acceptable manufacturers: Mueller, Keckley, Elliott, Webster.
- B. Cast semi-steel body or cast iron construction for steel piping and bronze body construction for copper piping; equipped with removable, Monel or stainless steel 20 mesh, water screen; maximum pressure drop 2 psi with free area at least four times area of pipe. Provided with blow-off outlet piped to nearest floor drain in mechanical rooms or provide hose thread with cap for concealed applications.
- C. Sizes 5" and smaller - "Y" type.
- D. Sizes 6" and larger - top removable basket type.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install hydronic specialty items in locations shown on drawings.
- B. Insulate any components subject to sweating or any hot or cold service in accordance with Section 23 07 00.
- C. Utilize manufacturer's instructions to install specialty items. Manufacturer's instructions must be adhered to for proper operation of air removal devices and flow control valves.
- D. Provide manual air vents at top of pipe risers and other locations where air can be trapped or collected.
- E. Pipe relief valve outlets and drain connections from hydronic systems to nearest floor drain.
- F. Support pump inlet and strainer fittings with floor mounted pipe and flange supports.
- G. Locate thermometers and pressure gauges no higher than 7 feet above finished floor elevation, positioned to be read from the floor.
- H. After systems are started up, placed in service and tested/adjusted to perform as designed, contractor shall provide competent representative to demonstrate proper operation and provide instruction to maintenance personnel to include performance on both cooling and heating cycles.
- I. Applicable hydronic specialties that are part of insulated piping system are to be insulated after installation by Contractor.

END OF SECTION