

SECTION 23 2214
STEAM AND CONDENSATE HEATING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steam traps.
- B. Steam air vents.
- C. Flash tanks.
- D. Deaerators.
- E. Boiler feed units.
- F. Condensate return units.
- G. Receivers.
- H. Condensate pumps.
- I. Pressure reducing valves.
- J. Steam safety valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0513 - Common Motor Requirements for Plumbing Equipment: Pump motors.
- B. Section 22 0716 - Plumbing Equipment Insulation.
- C. Section 22 0719 - Plumbing Piping Insulation.
- D. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Pump motors.
- E. Section 23 0716 - HVAC Equipment Insulation.
- F. Section 23 0719 - HVAC Piping Insulation.
- G. Section 23 2213 - Steam and Condensate Heating Piping.
- H. Section 23 5213 - Electric Boilers.
- I. Section 23 5223 - Cast-Iron Boilers.
- J. Section 23 5233.16 - Steel Water-Tube Boilers.
- K. Section 23 5239.13 - Scotch Marine Boilers.
- L. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.
- B. ASME B31.9 - Building Services Piping; 2014.
- C. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications; 2013.
- D. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- E. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2012.
- F. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:

1. Provide for manufactured products and assemblies required for this project.
 2. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
 4. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate application, selection, and hookup configuration. Include pipe and accessory elevations.
- D. Operation and Maintenance Data: Include installation instructions, servicing requirements, and recommended spare parts lists.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with State of _____ standard for installation of boilers and pressure vessels.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 STEAM TRAPS

- A. Manufacturers:
1. Armstrong International, Inc; _____: www.armstronginternational.com.
- B. Steam Trap Applications:
1. Use Thermostatic Steam Traps for:
 - a. Steam radiation units.
 - b. Convectors.
 - c. Unit ventilators.
 - d. Other similar terminal heating units.
 2. Use Float and Thermostatic Traps for:
 - a. Unit heaters.
 - b. Converters.
 - c. Heating coils.inverted bucket or
 - d. Steam separators.
 - e. Flash tanks.
 - f. Steam jacketed equipment.
 - g. Direct steam injected equipment.
 - h. Deaerators.
 - i. Process equipment.
 - j. Main headers.
 - k. Branch lines.
 3. Use Inverted Bucket Steam Traps for:
 - a. Main headers.
 - b. Branch lines.
 - c. Steam jacketed equipment.
 - d. Direct steam injected equipment.

- e. Deaerators.
- C. Steam Trap Performance:
 - 1. Select to handle minimum of two times maximum condensate load of apparatus served.
 - 2. Pressure Differentials:
 - a. Low Pressure Systems (15 psi maximum): 2 psi.
 - b. Medium Pressure Steam (60 psi maximum): 15 psi.
 - c. High Pressure Steam (150 psi maximum): 40 psi.
- D. Inverted Bucket Traps: ASTM A126, cast iron or semi-steel body with bolted cover, brass bucket, stainless steel seats and plungers, and stainless steel lever mechanism with knife edge operating surfaces.
 - 1. Rating: 60 psi WSP.
 - 2. Features: Access to internal parts without disturbing piping, top test plug, bottom drain plugs.
 - 3. Accessories:
 - a. Integral inlet strainer of brass.
 - b. Integral inlet check valve.
 - c. Integral bimetal air vent.
- E. Float and Thermostatic Traps: ASTM A126 cast iron or semi-steel body and bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly
 - 1. Rating: 15 psi WSP.
 - 2. Features: Access to internal parts without disturbing piping, bottom drain plug.
 - 3. Accessories: Gage glass with shut-off cocks.
- F. Thermodynamic Traps: Stainless steel body, disc, and cap.
 - 1. Rating: 300 psi WSP.
 - 2. Features:
 - a. Stainless steel insulating cap.
 - b. 1/4 inch steel blow down valve.
 - c. Integral strainer.
- G. Pressure Balanced Thermostatic Traps: ASTM A395/A395M cast iron body and bolted or screwed cover and integral ball joint union for 125 psi WSP; phosphor bronze bellows, stainless steel valve and seat, integral stainless steel strainer.

2.02 STEAM AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International, Inc; _____: www.armstronginternational.com.
 - 2. Bell and Gossett, a xylem brand; _____: www.bellgossett.com.
 - 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.03 FLASH TANKS

- A. Manufacturers:
 - 1. Armstrong International Inc; _____: www.armstronginternational.com.
 - 2. Penn Separator Corporation; _____: www.pennseparator.com.
 - 3. Wessels Company; _____: www.westank.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Tank: Closed type, welded steel construction, cleaned, prime coated, and supplied with steel support legs.
 - 1. Tested and stamped in accordance with ASME BPVC-VIII-1.
 - 2. Working Pressure: 100 psi.
 - 3. Construct with nozzles and tappings for installation of accessories and piping connections.

2.04 DEAERATORS

- A. Manufacturers:

1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Cleaver-Brooks; _____: www.cleaver-brooks.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Deaerator System: Consists of storage tank, surge tank, boiler feed pumps, transfer pumps, float switches, control panel and accessories.
- C. Deaerator Storage Tank:
1. Horizontal welded steel, ASME BPVC-VIII-1 stamped construction.
 2. Working Pressure: 50 psi.
 3. Manhole: 11 by 15 inch.
 4. Base: Elevated, fabricated steel.
- D. Storage Tank Accessories:
1. Steam pressure reducing valve.
 2. Water level gage glass.
 3. Manual and automatic vent valves.
 4. Pressure relief valve.
 5. Thermometer.
 6. Pressure gage.
 7. Overflow drain.
 8. Manual drain valve.
 9. Pressure gages on pump discharge.
 10. Bronze isolation valves and strainers between boiler feed pumps and tanks.
 11. Double pole high and low level alarm float switches.
- E. Surge Tank: Horizontal welded steel.
1. ASME BPVC-VIII-1 stamped construction.
 2. Working Pressure: 50 psi.
 3. Manhole: 11 by 15 inch.
 4. Base: Elevated, fabricated steel.
- F. Surge Tank Accessories:
1. Water level gage glass.
 2. Pressure relief valve.
 3. Thermometer.
 4. Pressure gage.
 5. Inlet diffuser.
 6. Overflow drain.
 7. Manual drain valve.
 8. Pressure gages on pump discharge.
 9. Bronze isolation valves and strainers between transfer pumps and tank.
 10. Double pole low level alarm float switch.
- G. Boiler Feed Pumps: One stage, vertical design, bronze fitted with stainless steel shaft, bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to 3500 rpm motor.
- H. Transfer Pumps: Vertical design, bronze fitted with stainless steel shaft, enclosed bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to motor.
- I. Control Cabinet:
1. NEMA 250 enclosure, UL listed, with piano hinged door, grounding lug terminal strip and fusible control circuit transformer.
 2. Combination magnetic starters with overload relays, circuit breakers and cover interlock.
 3. Electric alternator, 'Auto-Off' switch.
 4. Selector 'lead-off-lag' switches.
 5. Alarm lights, acknowledge button, test buttons, alarm horn.
- J. Control Sequence:
1. Operate transfer pumps on high level alternating after each cycle.

2. Operate boiler feed pumps from boiler controls; refer to Section 23 5223.

2.05 LOW PRESSURE BOILER FEED UNITS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Cleaver-Brooks; _____: www.cleaver-brooks.com.
 3. Marshall Engineered Products Company; _____: www.mepcollc.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Boiler Feed Units: Consist of receiver, inlet strainer, pumps, water make-up assembly, electric control components and accessories.
- C. Condensate Receiver: Cast iron, equipped with water level gage, dial thermometer, pressure gages on pump discharge, bronze isolation valves and strainer between pumps and receiver, and lifter eye bolts.
- D. Inlet Strainer: Cast iron, with vertical self-cleaning easily removable bronze screen and large dirt pocket, mounted on receiver.
- E. Water Make-Up Assembly: Level control switch and solenoid valve mounted on receiver.
 1. Valve: Packless, piston pilot operated type with cushioned closing and epoxy resin molded waterproof coil.
 2. Capacity: Equal to one boiler feed pump.
 3. With strainer, and manual bypass.
- F. Pumps: Vertical design, bronze fitted with stainless steel shaft, enclosed bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to motor.

2.06 HIGH PRESSURE BOILER FEED UNITS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Cleaver-Brooks; _____: www.cleaver-brooks.com.
 3. Marshall Engineered Products Company; _____: www.mepcollc.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Boiler Feed Units: Consist of receiver, inlet strainer, pumps, water make-up assembly, electric controls and NEMA 250 control cabinet, and accessories.
- C. Condensate Receiver: Horizontal welded steel construction with cradles, inlet cascade baffle and dished heads.
- D. Inlet Strainer: With self-cleaning bronze screen and large dirt pocket on receiver. Screen shall be vertically removable for cleaning.
- E. Water Make-up Assembly: Level control switch and solenoid valve mounted on receiver.
 1. Valve: Packless, piston pilot operated type with cushioned closing and epoxy resin molded waterproof coil.
 2. Capacity: Equal to one boiler feed pump.
 3. With strainer, and manual bypass.
- F. Accessories:
 1. Water level gage.
 2. Dial thermometer.
 3. Low water cut-off switch.
 4. Pressure gages on pump discharge.
 5. Bronze isolation valves and strainer between pumps and receiver.
- G. Pumps: One stage, vertical design, bronze fitted with stainless steel shaft, bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to 3500 rpm motor.

2.07 LOW PRESSURE CONDENSATE RETURN UNITS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.

2. Marshall Engineered Products Company; _____: www.mepcollc.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Condensate Return Units: Consist of receiver, inlet strainer, pumps, float switches, control panel and accessories.
 - C. Condensate Receiver: Cast iron, equipped with externally adjustable float switches, water level gage, dial thermometer, pressure gages on pump discharge, bronze isolation valves between pumps and receiver, and lifting eye bolts.
 - D. Inlet Strainer: Cast iron with vertical self-cleaning bronze screen and large dirt pocket, mounted on receiver. Screen shall be easily removable for cleaning.
 - E. Pumps: One stage, vertical design, bronze fitted with stainless steel shaft, bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to 1750 rpm motor.
 - F. Control Cabinet:
 1. NEMA 250 enclosure, UL listed, with piano hinged door, grounding lug, terminal strip, and fusible control circuit transformer.
 2. Combination magnetic starters with overload relays, circuit breakers and cover interlock.
 3. Electric alternator.
 - a. Operate pumps on high level, alternating after each cycle.
 - b. Operate second pump upon failure of first pump and alarm.
 4. 'Auto-Off' switch.
 5. Test button, high level alarm light, acknowledge button, alarm horn.

2.08 HIGH PRESSURE CONDENSATE RETURN UNITS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Marshall Engineered Products Company; _____: www.mepcollc.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Condensate Return Units: Consist of receiver, pumps, float switches, control panel and accessories.
- C. Condensate Receiver: Horizontal welded steel.
 1. ASME BPVC-VIII-1 stamped construction.
 2. Working Pressure: 125 psi.
 3. Base: Elevated, fabricated steel.
- D. Accessories:
 1. Air vent valve.
 2. Water level gage glass
 3. Pressure relief valve.
 4. Dial thermometer.
 5. Pressure gage.
 6. Corrosion inhibitor anode.
 7. Inlet baffle.
 8. Drain valve.
 9. Pressure gages on pump discharge.
 10. Bronze isolation valves between pumps and receiver.
 11. Double pole float switches.
- E. Pumps: One stage, vertical design, bronze fitted with stainless steel shaft, bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to 3500 rpm motor.
- F. Control Cabinet:
 1. NEMA 250 enclosure, UL listed, with piano hinged door, grounding lug, terminal strip, and fusible control circuit transformer.
 2. Combination magnetic starters with overload relays, circuit breakers and cover interlock.

3. Electric alternator, 'Auto-Off' switch.
 - a. Operate pump on high level, alternating after each cycle.
 - b. Operate second pump upon failure of first pump and alarm.
4. Selector 'lead-off-lag' switches.
5. Test buttons, high level alarm light, acknowledge button, alarm horn.

2.09 RECEIVERS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Marshall Engineered Products Company; _____: www.mepcollc.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Condensate Receiver: Horizontal welded steel, ASME BPVC-VIII-1 stamped construction for 125 psi working pressure with elevated, fabricated steel base and equipped with tappings for mounting float switches, water level gage, thermometers, pump suction fittings, condensate inlet, and lifting eye bolts.

2.10 CONDENSATE PUMPS

- A. Manufacturers:
 1. Bryan Steam Corporation; _____: www.bryanboilers.com.
 2. Marshall Engineered Products Company; _____: www.mepcollc.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Pumps: Vertical design, bronze fitted with stainless steel shaft, enclosed bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to motor.

2.11 PRESSURE REDUCING VALVES

- A. Manufacturers:
 1. Armstrong International, Inc; _____: www.armstronginternational.com.
 2. McDonnell & Miller, a xylem brand; _____: www.mcdonnellmiller.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Bronze or cast iron body, stainless or chrome steel valve spring, stem, and trim, phosphor bronze diaphragm, direct acting, threaded up to 2 inches, flanged over 2 inches.

2.12 SAFETY RELIEF VALVES

- A. Manufacturers:
 1. Armstrong International, Inc; _____: www.armstronginternational.com.
 2. ITT McDonnell & Miller, a xylem brand; _____: www.mcdonnellmiller.com.
 3. Spirax-Sarco; _____: www.spiraxsarco.com/us.
- B. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labelled.
- C. Accessories: Drip pan elbow.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install steam and steam condensate piping and specialties in accordance with ASME B31.9.
- B. Install specialties in accordance with manufacturer's instructions.
- C. Steam Traps:
 1. Provide minimum 3/4 inch size on steam mains and branches.
 2. Install with union or flanged connections at both ends.
 3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
 4. Provide minimum 10 inch long, line size dirt pocket between apparatus and trap.

- D. Remove thermostatic elements from steam traps during temporary and trial usage, and until system has been operated and dirt pockets cleaned of sediment and scale.
- E. Provide pressure reducing stations with pressure reducing valve, valved bypass, strainer and pressure gage on upstream side, relief valve and pressure gage on downstream side of pressure reducing valve.
 - 1. Pressure reducing station shall be one or two stages as required, to produce flat reduced pressure curve over range of capacity.
 - 2. Locate pilot operator control minimum 6 feet downstream of valve.
- F. Rate relief valves for pressure upstream of pressure reducing station, for full operating capacity. Set relief at maximum 20 percent above reduced pressure.
- G. Terminate relief valves to outdoors. Provide drip pan elbow with drain connection to nearest floor drain.
- H. When several relief valve vents are connected to a common header, header cross section area shall equal sum of individual vent outlet areas.

END OF SECTION 23 2214