

SECTION 23 22 00
STEAM DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Description of system:
 - 1. Pressure reducing valves.
 - 2. Safety valves.
 - 3. Steam and steam condensate valves.
 - 4. Specialties.
 - 5. Pipe and fittings.
 - 6. Condensate pumps and receiver.
- B. Work installed but not furnished:
 - 1. Automatic valves: Furnished in Section 25 50 00:
 - a. Provide necessary fittings and reducers.

1.2 QUALITY ASSURANCE

- A. Manual valve standards: Section 20 05 23 (for valves labeled "V-__").
- B. Piping standards: Section 20 11 00.

1.3 SUBMITTALS

- A. Shop drawings:
 - 1. Piping layouts at 1/4 IN/FT scale.
- B. Product data:
 - 1. Pressure reducing valves.
 - 2. Safety valves.
 - 3. Steam valves.
 - 4. Steam condensate return valves.
 - 5. Traps.
 - 6. Condensate pumps/receivers.
- C. Contract closeout information:
 - 1. Operating and maintenance data.
 - 2. Test reports.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Acceptable manufacturers:
 - 1. Pressure reducing valves (pilot operated):
 - a. Base:
 - 1) Spence.
 - 2. Safety valves, steam:
 - a. Base:
 - 1) Spence.

- b. Optional:
 - 1) Farris (Division of Curtis-Wright Flow Control).
 - 2) Watts.
 - 3) Consolidated.
 - 4) Dresser, Inc.
- 3. Steam traps:
 - a. Base:
 - 1) Spirax Sarco.
 - b. Optional:
 - 1) Illinois.
 - 2) Armstrong International.
 - 3) Hoffman Specialty.
 - 4) Mepco.
- 4. Condensate pumps/receiver:
 - a. Base:
 - 1) Domestic Pump ITT.
 - b. Optional:
 - 1) Dunham-Bush.
 - 2) Nash Engineering Co.
 - 3) Roth.
 - 4) Spirax Sarco.
- 5. Blowdown separators:
 - a. Base:
 - 1) Pennsylvania Separator Co.
 - b. Optional:
 - 1) Adamson Co., Inc.
 - 2) Cleaver Brooks.
- 6. Pressure powered pump:
 - a. Base:
 - 1) Spirax Sarco.
 - b. Optional:
 - 1) Armstrong International.
 - 2) Bell & Gossett, ITT.
- 7. Flash tank:
 - a. Base:
 - 1) Spirax Sarco.
 - b. Optional:
 - 1) Pennsylvania Separator Co.
 - 2) Adamson

2.2 PRESSURE REDUCING VALVES

- A. Pressure reducing valves - general:
 - 1. Flow capacity and pressure range: As indicated.
 - 2. Provide wye strainer on inlet side of each valve.
 - 3. Provide noise diffuser to limit rated sound level to 85 dBA at a distance of 3 FT from the valve.
 - 4. Follow pressure reducing valve manufacturer installation instructions when erecting pressure reducing station.
 - 5. Pressure reducing valve shall be Spence Type E.
 - 6. Pressure regulator pilot shall be Spence Type D for reduction from 125 psig to 60 psig and Spence Type D5 for reduction from 60 psig to 15 psig.
- B. Pressure reducing valves (1/2 – 4 IN): Pilot actuated diaphragm operated type:
 - 1. Cast iron body with raised face flanged end connections.
 - 2. Stainless steel seats and trim.
 - 3. Body rating: Class 250.

4. Cast iron pilot with stainless steel trim.
- C. Pressure reducing valves (over 4 IN): Pilot actuated diaphragm operated type:
1. Cast iron body, raised face flanged end connections.
 2. Class 250B per ANSI/ASME-B16.1.
 3. Shutoff classification: ANSI/FCI Class V.
 4. Main valve shall be single seated.
 5. Trim: Hardened stainless steel.
 6. Pilot shall be externally mounted to regulator body.

2.3 SAFETY VALVES

- A. Safety valves, steam:
1. Sizes 3 IN and less: Threaded or flanged ends:
 - a. Dresser, Inc. Consolidated Type 1511.
 2. For capacities over 3 IN use multiple valves.
 3. Valve sizing: Sized for 10 percent overpressure with a minimum of 5 PSIG overpressure on pressure reducing valve setting.
 4. ASME rated stainless steel seat & disc.
 5. Valves to have test levers.
 6. Safety valve discharge elbow: Spence Model DPE.
 7. Exhaust heads: Wright Austin Model 40 EHC.

2.4 STEAM VALVES TO 30 PSIG

- A. Isolation valves (gate valves):
1. 2 IN and smaller: V-2.
 2. 2-1/2 IN and larger: V-3.
- B. Check valves, vacuum breaker, (2 IN and smaller): V-23.
- C. Check valves, other:
1. 1-1/2 IN and smaller: V-25.
 2. 2 IN and larger: V-22 or V-28.

2.5 STEAM AND CONDENSATE VALVES OVER 30 PSIG

- A. Shutoff and Blowdown Valves:
1. 2 IN and Under: Bonney Forge – RP&C Gate Valve, Figure EF57D, Class 800, forged steel body, socket weld connections, “D” trim (13Cr/HF).
 2. 2-1/2 IN and Over (steam inside building, all condensate applications): Crane Figure 47XUF, 150 LB class, raised face flanged gate valve, carbon steel body, bolted bonnet, outside screw and yoke, one piece flexible wedge disc.
- B. Bypass Valves:
1. 2 IN and Under: Bonney Forge – RP&C Gate Valve, Figure EF57D, Class 800, forged steel body, socket weld connections, “D” trim (13Cr/HF).
- C. Check Valves:
1. 2 IN and Under: Bonney Forge – RP&C Check Valve, Figure F95D, spring loaded ball check valve, Class 800, forged steel body, socket weld connections, “D” trim (13Cr/HF).
 2. 2-1/2 IN and Over: Crane Figure 147X, 150 LB class, cast steel swing check, flanged ends.

2.6 STEAM CONDENSATE RETURN VALVES TO 30 PSIG

- A. Isolation valves (ball valves):
1. 2 IN and smaller: V-13 or V-14.
- B. Isolation valves (gate valves):
1. 2-1/2 IN and larger: V-3.

- C. Check valves:
 1. 2 IN and smaller: V-25.
 2. 2-1/2 IN and larger: V-28 or V-29.

2.7 SPECIALTIES

- A. Steam traps - general:
 1. Sizes: As indicated, minimum; increase size if required to meet capacity requirements.
 2. Provide dirt pocket and wye strainer full size of trap opening.
 3. Provide shut-off valve and union on each inlet.
 4. Provide check and gate valve in discharge, at each lift leg.
- B. Steam traps, low pressure (15 PSIG and less):
 1. Equipment traps: Use F & T type rated at 15 PSI working pressure. Each trap shall be sized using 1/2 PSI pressure drop and 2 times scheduled flow rate of equipment. Where two traps are shown on a single piece of equipment (e.g. heat exchanger), each trap shall be sized for 100% redundancy.
 2. End of main traps: Use F & T type. Trap sizes shall be as indicated on plans. If size is not indicated, the minimum trap size shall be 3/4 IN. The minimum capacities for each size of trap shall be as follows (based on 1/2 PSI differential):

Trap Size	Capacity
3/4 IN	550 lb/hr
1 IN	700 lb/hr
1-1/4 IN	950 lb/hr
1-1/2 IN	2100 lb/hr
2 IN	4000 lb/hr

- C. Steam traps, medium and high pressure (over 15 PSIG):
 1. Steam Trap Assembly: Trap shall be Yarway Series 712 inline renewable tilting disc-type thermodynamic trap with chrome-moly body in ASME SA-182 GR.F-11 and stainless steel trim. End connections shall be ANSI Class 600 socket welded. Trap shall have an integral strainer with stainless steel screen, and integral blow-off valve.
 2. Equipment traps (16-30 PSIG): Sized using 2 PSI pressure drop and 2 times scheduled flow rate of the equipment.
 3. Equipment traps (over 30 PSIG): Sized using 1/2 of the maximum pressure differential across the trap and 3 times scheduled flow rate of the equipment.
 4. End of main traps: Trap size: as indicated on plans. If size is not indicated, the minimum trap size shall be 3/4 IN. The minimum capacities for each size of trap shall be as follows (based on 2 PSI differential):

Trap Size	Capacity
3/4 IN	1140 lb/hr
1 IN	2300 lb/hr
1-1/4 IN	3700 lb/hr
1-1/2 IN	5400 lb/hr
2 IN	10900 lb/hr

- D. Steam traps on equipment: Provide traps and cooling legs, 18 IN deep minimum:
 1. Connect trap line to cooling leg 6 IN from bottom.
 2. Provide cap.
 3. Install trap above floor (elevate equipment if necessary).
- E. Flash tank: Centrifugal design with stainless steel striking plate at point of inlet impingement with surfaces and baffles slanting for quick drainage and no pockets for condensate accumulation:

1. Inlets and outlets as indicated.
 2. Cemline Corporation.
- F. Strainers: See Section 20 05 19.
- G. Supports, sleeves and seals: See Section 20 05 29.
- H. Flashings: See Section 20 05 00.
- I. Thermometers: See Section 20 05 19.
- J. Pressure gauges:
1. Weksler Type AA14C, 1/4 IN bottom connection, white dial, numerals range of 0 to 160 psig with 20 PSIG figure intervals, with Type A03B siphon, and Type A10 tee handle cock.

2.8 PIPE AND FITTINGS 30 PSIG AND OVER

- A. Pipe:
1. 2 IN and smaller (steam): Schedule 80 black steel, conforming to ASTM-A106 Grade B, seamless.
 2. 2-1/2 IN and larger, (steam): Schedule 40 black steel, conforming to ASTM-A53 Grade B, seamless.
 3. All condensate pipe regardless of size: Schedule 80 black steel, conforming to ASTM-A106 Grade B, seamless.
- B. Fittings:
1. 2 IN and smaller: 3000 LB socket weld.
 2. 2-1/2 IN and larger: Seamless standard class carbon steel butt welding, conforming to ASTM-A234 Grade WPB and ANSI-B16.9.
- C. Unions (1/2 IN – 2 IN): 2000 LB carbon steel, socket weld, ground joint, integral seats, conforming to ASTM A105.
- D. Flanges: 150 LB class carbon steel, raised face, conforming to ASTM-A105 and ANSI-B16.5. Figure numbers are Tube Turn's:
1. 1/2 IN – 2 IN: Schedule 80 bore, socket weld.
 2. 3 IN and larger:
 - a. Welding Neck Flanges: Figure 30.
 - b. Slip-On Flanges: Figure 50.
 - c. Blind Flanges: Figure 70.
 3. Gaskets: Ring-type, 150 LB class:
 - a. For steam and condensate systems: Flexitallic 304 Stainless Steel, 1/8 IN thick, spiral wound.
 4. Bolts:
 - a. HPS and HPC: Alloy steel stud bolts, conforming to ASTM-A193, Grade B7.
- E. Elbolets and Thredolets: Bonney Forge, carbon steel, 3000 LB class, conforming to ASTM-A105 Grade II.
- F. Weldolets: Bonney Forge, carbon steel, extra strong class butt welding end connection, conforming to ASTM-A105 Grade II.

2.9 PIPE AND FITTINGS LESS THAN 30 PSIG

- A. Steam and steam vent piping: Black steel (Schedule 40), seamless piping:
1. 2-1/2 IN and larger: Use welded joints, with malleable steel fittings.
 2. 2 IN and smaller: Use threaded or welded joints with malleable steel (3000 PSI) fittings.

- B. Steam condensate and pumped condensate piping: Black steel (Schedule-80), seamless piping:
 - 1. 2-1/2 IN and larger: Use welded joints, with malleable steel fittings.
 - 2. 2 IN and smaller: Use threaded joints or welded joints with malleable steel (3000 PSI) fittings.
- C. Relief vent pipe and fittings: Same as steam piping.
- D. Flanges: 150 LB class carbon steel, raised face, conforming to ASTM-A105 and ANSI-B16.5. Figure numbers are Tube Turn's:
 - 1. 1/2 IN – 2 IN: Schedule 80 bore, socket weld.
 - 2. 3 IN and larger:
 - a. Welding Neck Flanges: Figure 30.
 - b. Slip-On Flanges: Figure 50.
 - c. Blind Flanges: Figure 70.
 - 3. Gaskets: Ring-type, 150 LB class:
 - a. For steam and condensate systems: Flexitallic 304 Stainless Steel, 1/8 IN thick, spiral wound.
 - 4. Bolts:
 - a. All except HPS and HPC: Steel, square headed machine, or full threaded stud bolts, conforming to ASTM-A307 Grade B and ANSI-B1.1 coarse thread series Class 2A fit.
- E. Elbolets and Thredolets: Bonney Forge, carbon steel, 3000 LB class, conforming to ASTM-A105 Grade II.
- F. Weldolets: Bonney Forge, carbon steel, extra strong class butt welding end connection, conforming to ASTM-A105 Grade II.

2.10 CONDENSATE PUMPS/RECEIVER

- A. Condensate pumps/receiver, above ground: Duplex, factory assembled, with pumps, receiver, and controls for above floor mounting:
 - 1. Capacity: As scheduled.
 - 2. Pump: Vertical submerged centrifugal or turbine type suitable for operation with 210 degF condensate:
 - a. Bronze impeller, renewable liners and stainless steel shafts.
 - b. Flanged mounted on receiver and close coupled to vertical motor.
 - c. Provide wafer type shutoff valves between receiver and pumps to isolate each pump for maintenance or replacement while system continues to operate.
 - 3. Motor: See Section 20 05 00:
 - a. Non-overloading at working pressure up to design pressure.
 - b. Provide magnetic starters for 3-phase motors.
 - 4. Float switches: Heavy duty 2-pole with seamless copper float and stainless steel rod.
 - 5. Receiver: Cast iron, with inlet, vent and overflow connections.
 - 6. Controls: Contained in a unit mounted NEMA II control cabinet with hinged door:
 - a. Two combination magnetic starters with circuit breakers and cover interlock.
 - b. Manual sequence control switches.
 - c. Manual select lead pump.
 - d. Each pump control circuit to be independent of the other.
 - e. Alternator: Provide simultaneous operation under peak load conditions; and operate second pump automatically, should active pump or its controls fail.
 - f. Provide control circuit transformer for each circuit.
 - 7. Provide inlet strainer with vertical self-cleaning bronze screen and large dirt pocket mounted on receiver.

2.11 PRESSURE POWERED PUMP

- A. Steam, low profile pressure powered pump:
 - 1. Body construction: Cast 316 iron.

2. Provide pump with float operated snap acting mechanism with no internal seals or packing, stainless steel trim, and hardened stainless steel mechanism bearing components with single piece motive inlet valve.
3. Provide pump with cycle counter to monitor volume of liquid being pumped and sight glass to monitor operation.
4. Size: 1-1/2 IN Spirax Sarco, Model PPEC.

2.12 FLASH TANK

- A. Flash tank, steam:
 1. Construction: Mild steel.
 2. Maximum operating pressure: 150 psig.
 3. Maximum operating temperature: 450 degF.
 4. Size: 16 IN diameter x 48 IN high.

PART 3 - EXECUTION

3.1 PIPING - GENERAL

- A. Install in accordance with Section 20 11 00 and Section 20 05 00.
- B. Provide drain piping from safety valves and valves that have test levers to floor drain.

3.2 STRAINERS

- A. Provide full line size wye strainers ahead of steam control valves (motor operated), steam traps, regulating valves, pumps, and where indicated:
 1. See Piping Specialties: Section 20 05 19.

3.3 JOINTS

- A. Joints shall be socket welded, butt welded, and flanged.

3.4 INSTALLATION

- A. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4 IN threaded nipple and cap.
- B. Install branch connections to supply mains using 45 degree fittings in main with take-off out of the top of the main. Use of 90 degree tee fittings is permissible, where use of 45 degree fittings is not practical. Where the length of a branch take-off is less than 10 feet, pitch branch line down toward main, 1/2 IN per foot.
- C. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

3.5 SLOPES

- A. Slope of Pipes: Down in direction of flow 1 IN in 40 FT-0 IN, unless otherwise specified or indicated on Drawings.

3.6 TESTING

- A. Allow no piping to be insulated, concealed, or furred-in until it has been tested to satisfaction of Engineer.
- B. Upon completion of a section or of entire piping systems, test pipes as follows:
 1. Steam and Condensate Systems (Vacuum to 30 psig):
 - a. Test medium temperature shall not exceed 100 degF.
 - b. Test system hydrostatically at 75 psig.
 - c. Isolate system from source of pressure, and allow system to stand for four (4) hours during which time no drop in pressure shall occur.

2. Steam and Condensate Systems (30 to 150 psig):
 - a. Test medium temperature shall not exceed 100 degF.
 - b. Test system hydrostatically at 225 psig.
 - c. Isolate system from source of pressure, and allow system to stand for four (4) hours during which time no drop in pressure shall occur.
- C. Repair leaks and replace defective pipe disclosed by tests and repeat tests until no drop in pressure.

3.7 CLEANING

- A. Cleaning of steam supply piping: Before steam supply system is placed in service either for temporary or permanent use, clean and flush as follows:
 1. For temporary use where additional piping will be added to system as construction proceeds, flush piping by "blowing down" with steam.
 2. At completion of project after piping is complete, flush piping by "blowing down" with steam until visual inspection indicates system cleaned. During "blow down" period: Waste condensate to sewer.
 3. After "blow down" period is complete, thoroughly clean strainers and traps.
- B. Cleaning of condensate return piping: Before steam condensate return system is placed in service either for temporary or permanent use, clean and flush as follows:
 1. For temporary use where additional piping will be added to system as construction proceeds, and before strainers, traps, equipment, etc., are installed, flush piping by "blowing down" with steam.
 2. At completion of project after piping is complete, and steam supply mains are "Blown Down", flush steam condensate return piping by "blowing down" with steam until visual inspection indicates system cleaned.
 3. Prior to "blowing down" system remove strainers and traps from system and bypass equipment connected to system.
 4. During "blow down" period: Waste condensate to building sewer.
 5. After "blow down" period, clean strainers and traps and reinstall in piping system. Reconnect equipment previously bypassed.
 6. For steam traps and all equipment, follow manufacturer's installation recommendations.

END OF SECTION