

SECTION 15521 – STEAM AND CONDENSATE SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish and install all steam and condensate specialties and equipment to make complete and operations systems.
- B. All systems shall be installed in accordance with local code including vent piping and relief discharge termination points.
- C. Secure all permits and local/state approvals for the installation of all components included under this Section.

1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
- B. Material standards shall be as specified or detailed hereinafter and as follows:
 - 1. ANSI: American National Standards Institute
 - 2. A13.1: Scheme for Identification of Piping Systems
 - 3. B16.1: Cast Iron Pipe Flanges and Flanged Fittings
 - 4. B16.3: Malleable Iron Threaded Fittings
 - 5. B16.4: Cast Iron Threaded Fittings
 - 6. B31.1: Power Piping
 - 7. B36.10: Welded and Seamless Wrought Steel Pipe

8. ASTM: American Society for Testing and Materials
 - a. A 234/A23AM: Pipe Fittings of Wrought Carbon Steel and Alloy / Rev A: Steel for Moderate and Elevated Temperature
 - b. A 395 – Standard Specification for Ferric Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 - c. F 36: Compressibility and Recovery of Gasket Materials
 - d. F 37: Sealability of Gasket Material

9. ASME
 - a. ASME (BPV IX) – Boiler and Pressure Vessel Code, Section IX – Welding and Brazing Qualification
 - b. ASME B16.3 – Malleable Iron Threaded Fittings Class 150 and 300
 - c. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
 - d. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - e. ASME B31.1 – Code for Power Piping
 - f. ASME B31.9 – Building Services Piping; (with Addenda)

1.5 DESCRIPTION

- A. All specialties shall be a product of the United States of America. Mill certificate shall be provided as required.

1.6 SUBMITTALS

- A. See Section 15050 and general conditions for additional requirements.
- B. Manufacturer’s Installation Instructions: Indicate hanging and support methods, joining procedures.
- C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

- A. Installer: Company specializing in performing work of the type specified in this section, with documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of steam and condensate piping systems including specialties.

- B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Provide temporary end caps and closures piping and fittings. Maintain in place until installation.
- B. Protect piping systems and specialties from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.10 ENVIRONMENTAL

- A. Do not install piping when environmental conditions are outside the specific limitations of the referenced codes and manufacturer's recommendations.

PART 2 – PRODUCTS

2.1 PRESSURE REDUCING VALVES.

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Spence
 - 2. Leslie
 - 3. Copes Vulcan
- B. Furnish and install, as shown and scheduled on the drawings, steam pressure reducing valves of the self-operated, external pilot type, single seated, normally closed, metal diaphragm actuated, ss stem, ss diaphragm, similar to Spence Type ED.
- C. Valves shall regulate an accurate delivery pressure within ± 1 lb. throughout the range of pressure and flow conditions scheduled, regardless of deviation of the inlet steam pressure. Valves shall function quietly and shut tight on deadend shutoff. Regulators shall respond quickly and accurately without pressure deviation when installed on a 2-stage reduction.
- D. Bodies 2" and under shall have screwed ends, cast iron body, 250 lb. working pressure construction, size 2 1/2" and up shall have flanged ends. Seats and discs shall be guaranteed by the manufacturer against the wire drawing action of steam. Stems shall be stainless steel.
- E. Main valve spring shall be installed in the general area of the diaphragm pressure plate to minimize stem guiding surface and to keep the spring out of the patch of the steam. Stuffing boxes will not be permitted. All parts must be accessible and replaceable without removal of the valve from the line.

- F. The pressure pilot shall be separate from the main valve and connected to it by unions. A strainer screen shall be built into the pilot inlet. Pilot shall be interchangeable with all sizes of main valves and connected to the main valve by unions. Bleedports and other orifice fittings shall be externally connected to facilitate troubleshooting and cleaning. Internal bleedports will not be permitted.
- G. Base bypasses or internal pressure relieving port, when used, shall be located away from the jetting action of the flow through the seat and disc.
- H. The maximum or end point capacity of the regulator shall not pass more than 20% in excess of the required capacity. (Safety valve to be sized to pass 100% of the maximum or end point capacity.)
- I. Valves shall be sized so that the valve body inlet velocity does not exceed 8000 fpm and the valve body outlet velocity does not exceed 20,000 fpm or the combined inlet and outlet velocity does not exceed 28,000 fpm.
- J. Provide inlet gate valve, steam strainer, outlet gate valve, bypass and safety valve as shown on the drawings.
- K. Provide noise suppressors and muffling orifice plates downstream of each PRV valve as shown on the drawings. Suppressors similar to Spence Model "B".
 - 1. Each suppressor shall have its inlet the size of the reducing valve and be expanded to the outlet side equal to the final pipe size as shown on the plans. Suppressor shall be decepative-reactive type, straight through design with no diverting baffles on its interior. All internal acoustical packing shall be of corrosion resistant material. Unit shall be capable of reducing the noise emanating from the downstream piping by at least 20 dB. Submit laboratory test data to support performance capabilities.

2.2 SAFETY VALVES

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Lonergan
 - 2. Crane
 - 3. Kennedy
- B. Safety valves shall be of size and setpoint as required by PRV manufacturer.
- C. Valves shall be cast iron body, lead seal, asbestos free packing and gasket and brass shaft. All internal parts made of cold rolled steel shall be cadmium plated. Provide drain pipe and valve to nearest floor drain and flexible connectors at pipe discharge as shown on the drawings.

2.3 STEAM TRAPS

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Armstrong
 - 2. Sarco
 - 3. Velan
 - 4. Strong
- B. Provide steam traps at all low points of the low pressure & medium pressure steam systems, at equipment and as shown on the drawings and required by job conditions. Steam traps used for equipment using low pressure steam (LPS) shall be the closed float and thermostatic type.
- C. Traps used for medium (MPS) shall be Class 300 inverted bucket type.
- D. Float and thermostatic type traps shall have cast iron body, ASTM A278, Class 30. Pipe connections shall be in the body and the entire trap mechanism attached to the cap. Float and mechanism shall be stainless steel with heat treated chrome steel valve. The float shall be Heliarc welded to avoid introduction of dissimilar metals. The thermostatic air vent shall be a balanced pressure phosphor bronze disc diaphragm type with stainless steel valve and seat.
- E. Traps shall be sized by SHEMA ratings with applicable safety factor applied. See execution section.
- F. Inverted bucket traps for high pressure service, Class 300, shall be fused steel with cap and body forgings made of 1030 carbon steel, inlet tube of alloy steel pipe, gasket bolts of high temperature low alloy steel, nuts of semi-finish hex, heat treated, stainless steel valve retainer, lever and guide pin assembly, chrome steel, heat treated valve and valve seat. Bucket shall be stainless steel cap and tube, cast iron weight.
- G. The HVAC Contractor shall submit orifice size/capacity characteristic for each trap furnished, dimensional and sectional drawings, and list of materials of construction.
- H. A suitable strainer with blow-off valve shall be installed ahead of each steam or drain trap.
- I. Monovalve float and thermostatic traps shall have a built-in strainer and check valve, stainless steel float, trim and pivots, cast iron body and stainless steel highly sensitive, bi-metal element with stellite seat made of hard stainless steel with mirror finish and ball bearing precision.
- J. Drip points shall be provided at the ends of mains and at points where a rise in elevation is required, whether such traps are shown on the drawings or not, to suit the job installation conditions. Provide a dirt pocket of suitable size and length as detailed on the drawings fit with a cap. Drip traps shall be 3/4" size unless otherwise indicated.
- K. The Contractor, in addition to all traps shown or called for by notes on the drawings and specified herein, shall provide ten (10) 1" (one inch) size additional trap assemblies for each pressure category included in his base bid price, to be installed in areas as directed by the

Architect in the field. This price shall include all valving and accessories detailed on the drawings, as well as 20 linear feet of 1" pipe, thermal insulation and the labor and material to make connections to condensate mains.

2.4 PRESSURE POWERED CONDENSATE PUMP TRAPS

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Spirax Sarco
- B. Furnish and install according to details and schedule on the drawings and manufacturer's instructions, pressure powered condensate pump traps.
- C. The units shall be Spirax Sarco type PPEC low profile pressure powered pump, as indicated on the drawings and operated by maximum 125 psig steam or compressed air. The pressure powered units shall not require any electrical energy, and shall be safe for use in explosive atmospheres. Body construction of cast iron, cast steel, or cast 316 stainless steel, for pumping liquids of specified gravity of 0.65 and above. The pump shall contain a float operated snap-acting mechanism with no external seals or packing, stainless steel trim and hardened stainless steel mechanism bearing components with single piece motive inlet valve. Pump shall be provided completed with inlet and outlet check valves attached at the factory for ease of field installation. Pump shall be equipped with a cycle counter to monitor the volume of liquid being pumped, and a sight glass to monitor operation.

2.5 CONDENSATE PUMP SETS

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Flotronics
 - 2. Shipco
 - 3. Skidmore
 - 4. Domestic
- B. Furnish and install according to details and schedule on the drawings and manufacturer's instructions, duplex condensate pump sets.
- C. All controls for the pump operation shall be prewired and unit shall need a single electrical connection to be fully operational.
- D. Unit shall consist of cast iron receiver, inlet strainer, (2) pumps (minimum 2'-0" NPSH each), float switches, electrical controls and accessories, as follows:
 - 1. Receiver shall be manufactured of close grained cast iron. The receiver shall be equipped with externally adjustable 2-pole float switch, water level gauge and eye bolts. Pressure gauges shall be provided in the field by the Contractor.

2. A cast iron inlet strainer with vertical self-cleaning bronze screen and large dirt pocket and (1) dial thermometer with well shall be mounted on the receiver. The screen shall be easily removable for cleaning, requiring no additional floor space for servicing.
3. The centrifugal condensate pumps shall be flanged mounted on the receiver. Provide bronze isolation valves between each pump and the receiver. The isolation valves shall be of the design that allows the entire pump and motor assembly to be removed for service, including the lower half of the pump case for wear ring replacement without draining the receiver. Pumps shall be close coupled vertical design, permanently aligned, bronze fitted and shall be equipped with stainless steel shaft, enclosed bronze impeller, renewable bronze case ring and mechanical shaft seal. Each pump shall be close coupled to a vertical dripproof motor. Pump capacities, motor HP and RPM, electrical characteristics and receiver size shall be as scheduled on the drawings. The unit manufacturer shall furnish, mount on the pump unit and wire a NEMA 4X control cabinet with piano hinged door and grounding lug, containing the following.
 - E. Disconnect switch and cover interlock to ensure complete electrical deactivation of the entire condensate handling system.
 - F. Magnetic starters (each having [3] overload relays) with fused line protection for each pump. Magnetic starters shall be designed to NEMA Standards and shall be as manufactured by General Electric, Westinghouse or Square D.
 - G. (2) Auto-Off-Test (A-O-T) selector switches.
 - H. Control circuit transformer having fused and grounded secondary when motor voltage exceeds 120V.
 - I. Numbered terminal strip.
 - J. Pump running lights.
 - K. Hour meters.
 - L. High level alarm and switch with auxiliary contacts for tie-in to BMS.
 - M. Condensate return system controls shall be provided by the unit manufacturer, as follows:
 1. When the level in the unit receiver rises to a preset high level, a mechanical alternator shall be provided to alternately activate the condensate pumps when the H-O-A selector switch is placed in the automatic position.
 2. When the pump has discharged the water and the condensate level in the receiver recedes to a preset low level the alternator will deactivate and stop the pump.
 3. If the condensate level in the receiver should continue to rise, with the lead pump running, to a second high level, the alternator will activate the second pump and will continue to operate both pumps until the water level recedes to the preset low level at which point the pumps will be deactivated.

4. The operation of each pump may be tested by moving the A-O-T selector switch to "test". When test is complete the selector switch shall be placed in "automatic" position.

N. Unit shall have factory installed wiring which shall be numbered for easy identification and the numbers shall coincide with those shown on the wiring diagrams.

O. The unit shall be factory tested as a complete unit. The pump manufacturer shall furnish complete elementary and connection wiring diagrams, piping diagrams, installation and operation instructions.

2.6 FLASH TANKS

A. Acceptable manufactures subject to compliance with the specifications:

1. Modern welding.
2. Armstrong
3. Wessel

B. Provide flash tanks as indicated on the drawings. Each tank shall be ASME rated. All seams shall be continuously welded.

C. The minimum ASME rating shall be 125 PSIG unless scheduled greater.

D. The minimum vent size shall be 6".

E. Tanks shall have (1) shop and (1) field coat of iron oxide primer. Provide tappings and supports as required and shown on the drawings. Tank shall have minimum 1/4" thick walls and shall be fully insulated.

F. Provide trap arrangement, relief valve and vent (pipe to atmosphere) and connections to low pressure steam, as shown on the drawings.

2.7 STEAM SEPERATOR

A. Acceptable manufactures subject to compliance with the specifications:

1. Spence
2. Wright Austin
3. Penn Separator Corp.
4. Sarco
5. Boylston Steam Specialty Co.

B. Pressure rating ANSI class to match the service.

C. Provided with drip assembly.

- D. Unit shall be a minimum of 99.0% efficient removing particulate and liquid 10 microns or larger in size.

2.8 EXHAUST HEAD

- A. Acceptable manufactures subject to compliance with the specifications:
 - 1. Penn Separator Corp.
 - 2. Boylston Steam Specialty Co.
 - 3. Sarco
- B. Pressure rating suitable for the service.
- C. Sized to pass the rated discharge.
- D. Self draining and self cleaning.
- E. Similar to Penn Separator Corp. Cyclone Exhaust Head.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install in accordance with manufacturers recommendations.
- B. Install in accordance with all applicable codes.

3.2 PRESSURE REDUCING VALVES

- A. Provide inlet gate valve, line size steam strainer, outlet gate valve, bypass and safety valve as shown on the drawings.

3.3 SAFETY VALVES

- A. Provide as indicate, required by code, and as recommended by manufacturer.

3.4 STEAM TRAPS

- A. General
 - 1. Provide drip trap assemblies as follows:

- a. Steam piping
 - 1) Maximum of 75 feet intervals.
 - 2) At rising points in piping
 - 3) At the bottom of all vertical pipes.
 - 4) At all steam entrance points at building wall.

B. Traps

- 1. Provide dirt pockets at all traps.
 - a. Dirt pockets shall be a minimum of 12 inches long.
- 2. Provide union on both sides.
- 3. Provide inlet with strainer
- 4. Provide discharge check valve.
- 5. Provide discharge shut off valve.
- 6. Locate traps.
 - a. So all traps can be accessed for replacement and maintenance.
 - b. At steam equipment.
 - c. Verify size, number, and locations.
 - d. Locate so as not to be subject to freezing.
 - e. For domestic hot water heaters coordinate with plumbing and install temperature regulators provided by plumbing.
- 7. Connect to the appropriate condensate return system.

C. Sizing

STEAM TRAP SIZING					
SYSTEM	SERVICE	QUANTITY	TYPE	SAFETY FACTOR (EA. Trap)	MAXIMUM PRESSURE DROP
LPS	Modulating Equipment	1	F&T	300%	1 psi
LPS	Convection Heating	1	F&T	200%	1 psi
LPS	Preheat coil	2	F&T	300%	1/2 psi
LPS	End of main drips	1	F&T	300%	1 psi
LPS	Drips on Main to 6"	1	F&T	300%	1 psi
LPS	Drips on Main 8" & up	2	F&T	300%	1 psi
MPS	Modulating Equipment	1	Inverted Buckett	300%	1 psi

STEAM TRAP SIZING					
SYSTEM	SERVICE	QUANTITY	TYPE	SAFETY FACTOR (EA. Trap)	MAXIMUM PRESSURE DROP
MPS	Convection Heating	1	Inverted Buckett	200%	1 psi
MPS	Preheat coil	2	Inverted Buckett	300%	1/2 psi
MPS	End of main drips	1	Inverted Buckett	300%	1 psi
MPS	Drips on Main to 6"	1	Inverted Buckett	300%	1 psi
MPS	Drips on Main 8" & up	2	Inverted Buckett	300%	1 psi
MPS	Boiler mains	2	Inverted Buckett	300%	1 psi

1. Minimum trap size shall be ¾".

3.5 FLASH TANKS

- A. Provide as indicated and as required by field installation.
- B. Provide a minimum of 6" vent unless indicated on the documents to be larger.

3.6 CONDENSATE PUMPS

3.7 TESTING

- A. Furnish all labor, material, instruments, supplies and services and bear all costs for the accomplishment of the tests herein specified. Correct all defects appearing under test and repeat the tests until no defects are disclosed; leave the equipment clean and ready for use.
- B. Perform all tests other than herein specified which may be required by Legal Authorities or by Agencies to whose requirements this work is to conform.
- C. Furnish all necessary testing apparatus, make all temporary connections and perform all testing operations required, at no additional cost to the Owner.
- D. All equipment and piping installed under this Contract shall be tested and found tight. Insulated or otherwise concealed piping shall be tested before being closed in.

All leaking joints shall be corrected, retested and found tight. Such tests shall conform to the requirements of Local Codes but shall not be less than the equivalent of the tests called for herein. Threaded joints that leak shall not be seal-welded to correct leakage.

- E. Tests performed shall not relieve the Contractor of his responsibility for leaks which may develop after the tests are made.
- F. All piping systems shall be subjected to a hydrostatic test at 1 1/2 times operating pressure measured at the highest point in the system, for a period of (4) hours without drop in pressure.
- G. Tests of piping systems shall be conducted before connections to equipment are made and before piping is covered, buried or otherwise concealed.
- H. Systems found to have leaks shall be subjected to further tests when faulty joints have been repaired or replaced.
- I. Welded joints shall be subjected to a hammer test while under pressure.

3.8 STEAM SEPERATOR

- A. Install in accordance with manufactures recommendations in the locations specified. Shown on plans and/or detailed.
- B. Pipe drip assembly.

3.9 EXHAUST HEAD

- A. Install as indicated and in accordance with manufactures recommendations.
- B. Increase pipe size to match exhaust head.
- C. Pipe drain full size to nearest drain or to the location indicated.

END OF SECTION