

## PART 1 - GENERAL

### 1.01 Intent of Document

The information included in this section is intended to identify the **SPECIFIC ITEMS** required by Oklahoma State University in the design and construction of facilities on the campus. Items of "normal, code, industry or standard construction practice" are not included in this section.

### 1.02 Use of Tunnels

All steam and condensate systems shall be run in walk-through tunnels as described elsewhere in this section. Where a walk-through tunnel is not possible, lines shall be run in concrete trenches as described elsewhere in this section. **No direct-buried steam or condensate lines will be allowed.** Other utility lines may be run in walk-through tunnels subject to the approval of OSU Physical Plant Utilities Services. No other utility lines may be run in concrete trenches without approval of OSU Physical Plant Utilities Services.

## PART 2 – DESIGN REQUIREMENTS

### 2.01 Velocity

Steam velocity shall not exceed 10,000 feet per minute.

### 2.02 Ventilation

Provide continuous ventilation throughout the tunnel.

### 2.03 Power and Lighting

Provide lighting at a minimum of 2 foot-candles in all locations. Provide a 120 v., 20 amp. weatherproof duplex receptacle located every 100 ft. high on the sidewall opposite the piping. All wiring shall be in conduit.

### 2.04 Identification

Identify steam and condensate lines using painted stencil letters every 100 ft.

### 2.05 Maintenance Access

- A. Provide a waterproof lift-off top access opening in walk-through tunnels every 300 feet for convenient installation and removal of 20 ft. pipe joints and tunnel equipment. In addition, provide manholes every 300 ft. for personnel access.
- B. Provide continuous waterproof lift-off top access openings in concrete trenches for removal and installation of 20 ft. pipe joints.

- C. Slope floor toward the piping side of the walk-through tunnels to minimize water on walking surfaces.
- D. Provide minimum ½" thick Armaflex insulation, or equal, with adhesive on lower edges of all components and mechanical supporting devices suspended between 4 and 7 feet above floor of walk-through tunnels (as personnel protection against head injury).
- E. A minimum of 12" horizontal and vertical clearance shall be allowed between utility lines and from the sides, top and bottom of tunnels and trenches. An exception is the clearance from the top of a trench, which may be closer, but not less than 4" from the top.

### **PART 3 – MATERIALS**

#### **3.01 Piping**

Schedule 40 black steel pipe minimum. Schedule 80 stainless steel 10 ft. upstream and 20 ft. downstream of condensate sparge.

#### **3.02 Fittings**

Eccentric fittings shall be used where piping sizes reduce on horizontal runs. Reducing fittings shall be couplings; bushings are not allowed. Use long-radius elbows having a minimum centerline radius of 1.5 pipe diameters. Fittings 2" and smaller shall have screwed connections. Fittings 2½" and larger shall have flanged or welded connections. Threaded fittings shall be cast iron or malleable iron.

#### **3.03 Tees in Welded Pipe**

Saddle and nipple type tees are permitted in welded pipe if made with Weld-O-Let or Thread-O-Let materials, and branch size does not exceed ½ the size of the main. All branches in excess of ½ main size shall be made using welded tees.

#### **3.04 Flanges**

Flanges shall be a minimum standard weight, 150 pound rated, forged steel slip-on. Bolts, bolt studs, nuts, and washers shall be Grade 8 minimum and have zinc plated finish. Steam flange gaskets shall have flexible graphite filler, stainless steel winding, carbon steel centering ring, 0.175" thickness (Garlock Style RW, Flexitallic Style CG, or equal). Condensate flange gaskets shall be 0.0625" thickness (Garlock IFG 5500 or equal).

#### **3.05 Unions**

Unions shall be malleable iron, ground joint type, Class 300 minimum. Unions shall be installed at each device requiring removal for maintenance, repair, or replacement.

### **3.06 Valves**

- A. Shutoff valves are not allowed in vertical steam piping.
- B. For 0-15 psig steam lines, isolation valves 2" and smaller shall be ball valves with threaded carbon steel body, stainless steel trim, filled PTFE (polytetrafluoroethylene) seat, and seal rated for a minimum of 300 psig at 400° F.
- C. Valves 2½" and larger shall be high performance butterfly valves. Use TYCO K-LOC butterfly valves with RTFE (reinforced polytetrafluoroethylene) seat, steel body, stainless steel disc, and stainless steel shaft.
- D. Butterfly and ball valves shall be of bubbletight construction.
- E. Butterfly valves shall be full lug construction, and allow for disconnection from piping in either direction while maintaining shutoff service.
- F. Manually operated butterfly valves shall have enclosed worm gear operators with position indicators. Manually operated ball valves shall have levers with locking devices. Maximum rim pull for valve manual gear operation shall not exceed 100 pounds.
- G. Strainer blowdown valves shall be blowdown connection size ball valves, so the mesh receive a sudden flow increase. These valves shall have a carbon steel body, stainless steel trim, filled PTFE (polytetrafluoroethylene) seat, PTFE seal, and carbon steel body fasteners (Jamesbury 21-2236 MTO Clincher or equal). A nipple and cap shall be installed in each valve outlet.

### **3.07 Insulation**

Pipe insulation shall be fiberglass, rigid, high density, pre-molded to size of pipe or fitting upon which it is used, and include dimpled aluminum jacket with stainless steel bands. All exposed edges of insulation shall be sealed, and a beveled termination shall be provided at all nameplates and uninsulated fittings.

### **3.08 Traps**

Traps shall be inverted bucket type, horizontal installation, with threaded end connections, and discharge orifice at top of trap (Armstrong 811 Series, no substitutes). Support traps over 25 pounds independent of connected piping. Traps shall be sized per manufacturer's recommendations for supervised warmup. Drip legs shall be sized for supervised warmup.

### **3.09 Strainers**

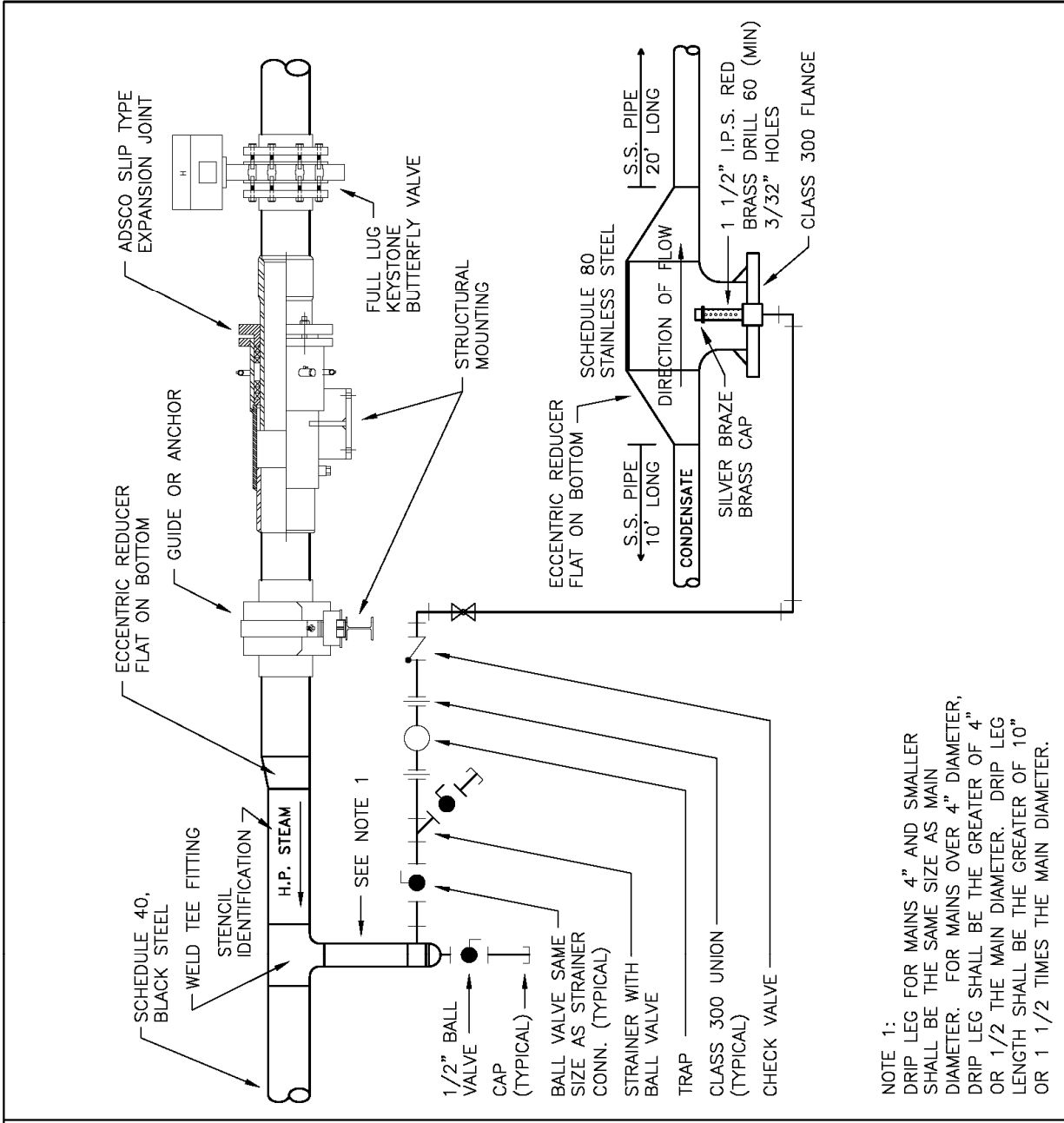
Strainers shall be of the "Y" type, cast iron bodies, with blowoff tapping in screen covers. Sizes ½" through 1½" shall have a Monel screen of 20 mesh. Size 2" and larger shall have a 1/64" thick stainless steel screen with a particle retention of 0.016". Install strainers ahead of all controlled devices. Install a blowdown valve for each strainer. Screens to be removeable without disturbing piping.

### **3.10 Supports**

- A. Support all piping from structure using concrete inserts, ceiling plates, wall brackets, or floor stands. Continuous insert channels are not allowed.
- B. Floor stands shall mount on a 4" high concrete housekeeping pad.
- C. Piping shall not be supported by other piping.
- D. Coat cut edges, welds, or any finish damage with galvanized paint. Bolts, nuts, studs, and washers shall be electro-plated zinc finish.

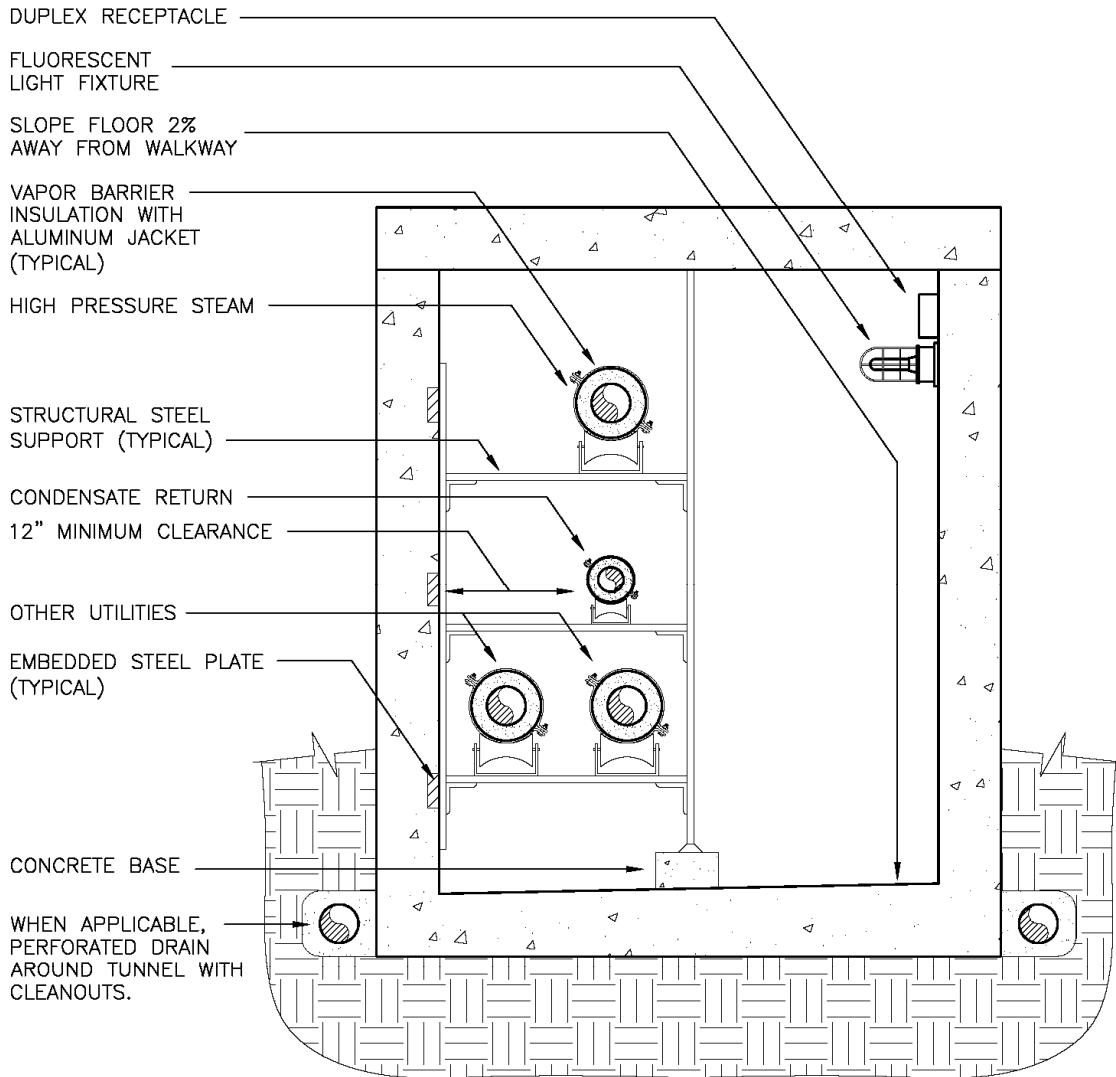
### **3.11 Expansion Devices**

Devices shall be slip joint type by ADSCO, Type RJ. No substitutions are allowed. Joint shall be designed for 50 psig steam at 400°F. Manufacturer shall be responsible for field precompressing joints to allow for difference between installation temperature and minimum design temperature. Manufacturer shall be required to review and approve in writing the installation of all expansion joints prior to system operation. Include a 5-year workmanship and material warranty.



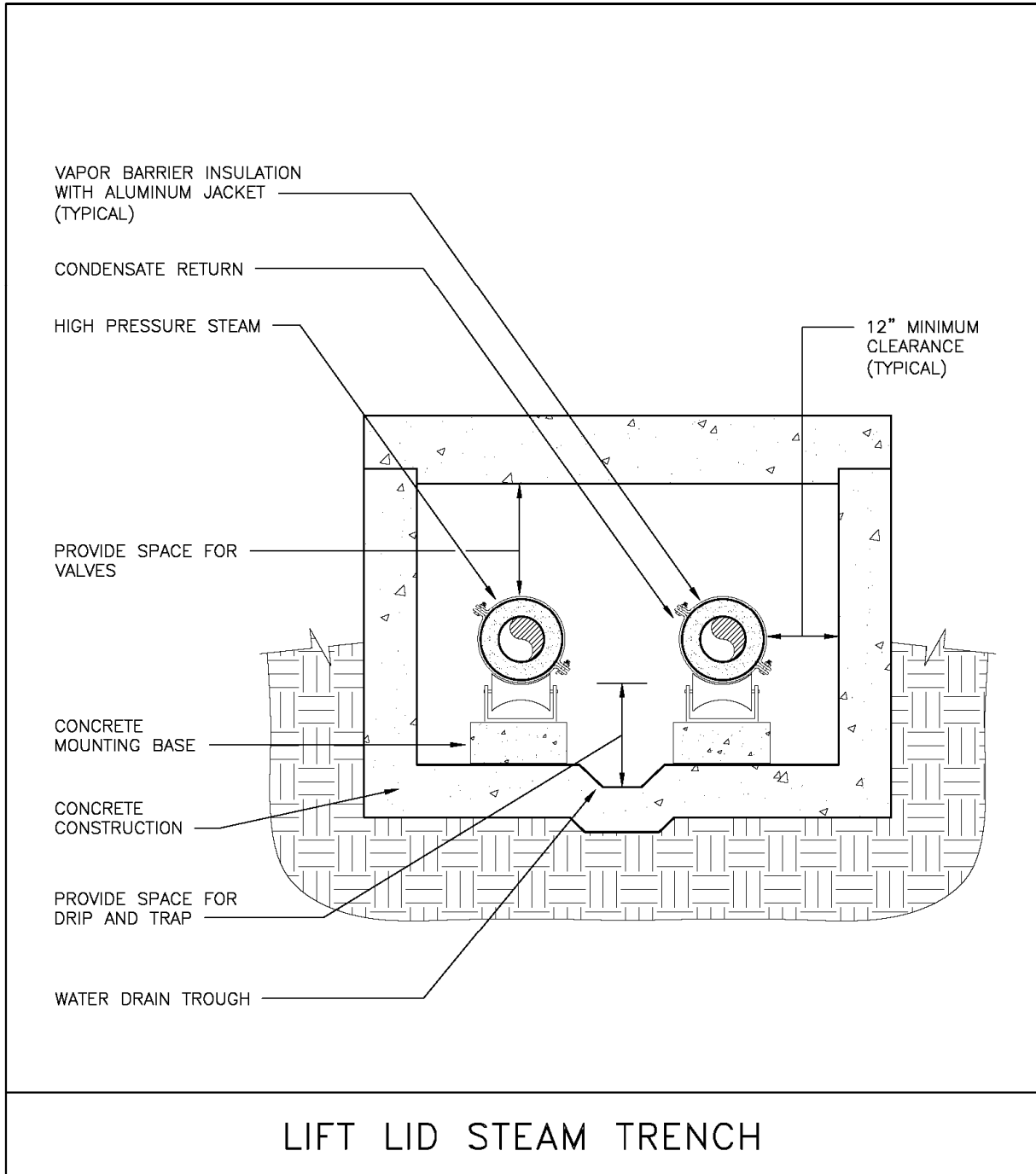
NOTE 1:  
DRIP LEG FOR MAINS 4" AND SMALLER SHALL BE THE SAME SIZE AS MAIN DIAMETER. FOR MAINS OVER 4" DIAMETER, DRIP LEG SHALL BE THE GREATER OF 4" OR 1/2 THE MAIN DIAMETER. DRIP LEG LENGTH SHALL BE THE GREATER OF 10" OR 1 1/2 TIMES THE MAIN DIAMETER.

STEAM AND CONDENSATE PIPING



STEAM TUNNEL DETAIL

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