GENERAL:

The scope of this document is to provide instruction for the installation, testing, and design of exterior underground steam and condensate piping installed.

Equipment and materials specified under these standards are to also be applied to steam and condensate service lines located inside the building, up to, and including the first building steam shutoff valve installed downstream of the steam meter, and the first building condensate shutoff valve.

DESIGN GUIDELINES:

Existing Conditions

1. All demolition of existing chases, tunnels, sidewalks, curbs, equipment pads, streets, etc., shall be clearly defined on the drawings and specifications.

2. All required demolition of existing pipe, pipe insulation and equipment shall be clearly defined on the drawings and specifications.

3. All known asbestos demolition shall be labeled as such on the drawings.

4. The University of Missouri – Columbia owns and operates a medium- pressure steam supply system that distributes steam from the University power plant to all campus buildings. A pumped condensate system returns steam condensate to the power plant from each building. This steam and condensate system is piped within a network of steam chases/tunnels and manholes.

5. University of Missouri – Kansas City steam supply is generated from three plants. The Miller Nichols Library plant generates steam at 50 psi, Biological Sciences/Spencer Chemistry Plant and Education School Plant both generate steam at 15 psi. Distribution from the Miller Nichols plant is generally between 15-25 psi and 15 psi for the other plants.

General Mechanical Requirements

1. Steam and condensate mains and services shall be installed in reinforced concrete chases, walk tunnels and manholes. All installed equipment and piping shall be accessible for maintenance and installed in manholes. All piping and structure installations shall be designed and installed in a manner to provide drainage of any water introduced into the systems. All systems shall also be ventilated either by natural or power ventilation.

2. Design Temperature and Pressure:
   2.1. A maximum operating pressure of 75 psig and a maximum operating temperature of 450° F shall be used as the design conditions for steam.

2.2. A maximum operating pressure of 75 psig and a maximum operating temperature of 200° F shall be used as the design conditions for condensate.

3. Maximum stresses in pipes shall be calculated and limited so as to conform to the ASME Power Piping Code, ANSI 31.1 (as last revised) "Power Piping"

4. Design professional shall coordinate with owner to determine size of steam and condensate service connection to new facility. Design professional shall submit design flows for the new facility to owner. Owner will supply provide the existing pressures at a point on the distribution system nearest the proposed site. Design professional shall submit proposed lines size for review by owner.

5. Steam and condensate piping shall be typically 2", 3", 4", 6", 8", 10" or 12". All service line connections to steam and condensate mains shall include a "three-valve" cluster which will allow for maximum valving flexibility.

6. Steam velocities for steam mains should be kept at or below 12,000 fpm with maximum pressure drop of 2 psi per 100 ft. or less.

7. Steam velocities for service connections shall be kept at or below 6,000 fpm with maximum pressure drop of 3 psi per 100 ft. or less.

8. Maximum pressure drop in condensate piping should be kept below 1/4 psi per 100 ft.

9. All steam valves 6" and larger shall have a warm-up line to facilitate safe start-up of the steam line.

10. Steam and condensate mains entering buildings shall be piped horizontally through the building exterior below-grade wall all per MU Construction Standard details. In cases where a building is constructed "slab-on-grade", the steam and condensate lines shall enter through a utility pit constructed as part of the building slab. This pit shall be sized large enough to allow for easy access and adequate work space.

11. All valves shall be located, sized, and the type shall be selected.

12. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation to the satisfaction of the Owner before steam will be turned on.

13. Pipe Expansion:
    13.1. Expansion loops or mechanical expansion joints are to be used for piping expansion compensation.
    13.2. All thermal expansion lengths and anchor moment/forces shall be calculated for both steam and condensate piping. These lengths and forces shall be shown on isometric piping drawings separated for steam and condensate. Isometric piping drawings shall also detail location and type of expansion loops, expansion joints, pipe hangers, supports, guides, and anchors.

13.3. Mechanical drawings shall include an expansion joint schedule identifying expansion joint manufacturer, model number, pipe size, cold length, installation length (if different than cold length), and maximum expansion travel.

13.4. All pipe anchors shall be fully designed to withstand all forces and moments at the anchor location, including hydrostatic test forces. Design shall include a factor of safety to allow for corrosion.

14. Steam Traps

14.1. All steam trap stations shall be located and all steam traps shall be sized. The condensate from each steam trap shall be routed to the appropriate flash tank.

14.2. Individual steam traps shall not serve more than one drain point.

Installation

1. Welding and Brazing

1.1. All welding, brazing, soldering and cutting work shall conform to applicable provisions of the following codes and requirements:

1.1.1. American National Standards Institute (ANSI) B31.1 (latest) Power Piping and Addenda

1.1.2. American Welding Society (AWS) D1.1 (latest) Structural Welding Code

2. Welding and brazing shall be performed only by skilled welders. Welders, and welding and brazing procedures shall be qualified in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. A record shall be maintained on the job showing the date and results of qualification test for each welder employed on the job. One certified copy of the qualification test for each welder so employed shall be furnished to the Owner's Representative.

Testing

1. On any given construction project, the owner will contract with an independent testing firm to complete ultrasonic shearwave weld inspections on owner selected field welds. If the results of these tests indicate poor quality welds, those “failed” welds shall be replaced at no additional cost to the project. If further ultrasonic inspection is required to assure quality weld workmanship, these tests shall be at the expense of the contractor, and any and all defective welds shall be replaced at no additional cost to the project.

Scheduling

1. Site utility tie-ins shall be coordinated with the Owner’s Representative. Contactor shall notify Owner’s Representative two (2) weeks in advance of desired tie-in time. Owner’s Representative will give Contractor 72 hours advance notice of actual time for tie-ins. Outages are to be kept to a minimum.

2. Tie-ins to utility systems shall be made on weekends or nights, and work shall be done around-the-clock until the tie-in is completed.

Commissioning

1. MU: Steam and condensate shall be turned on by Energy Management Utility Distribution personnel only. Owner's Representative will coordinate.

2. UMKC: Coordinate with Owner's Representative.