

**GENERAL:**

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The scope of this document is to provide instruction for the installation of underground domestic water lines installed for the University of Missouri using horizontal directional drilling.

**DESIGN GUIDELINES:**

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## 1. Materials, Pipe and Pipe Fittings, General

- 1.1. All underground water piping shall be PVC. EXCEPTION: Lines passing directly over steam tunnels or direct buried steam/condensate lines must be ductile iron with 2" R-5 extruded polystyrene insulation board between the pipe and steam lines.
- 1.2. PVC Pipe (Trenchless Construction)
  - 1.2.1. 2 Inches to 12 inches: AWWA C900; Class 150 (DR 18); cast iron O.D. equivalent; with grooved ends suitable for restrained joint coupling.
  - 1.2.2. Couplings: Non-metallic restrained joint coupling with PVC precision machined housing, nylon joint retaining splines, elastomeric O-ring seals, beveled leading edges, with pressure rating equal to or greater than pipe.
  - 1.2.3. Gaskets: ASTM F477, elastomeric seal.
  - 1.2.4. Coupling Lubricant: Coupling manufacturer's standard for permanent joints.
  - 1.2.5. Compliance: Complete restrained joint pipe and coupling system shall be Factory Mutual approved, Underwriter's Laboratory Listed, and shall comply with National Sanitation Foundation Standard No. 61 and UNI-BELL UNI-B-13.
  - 1.2.6. Restrained joint piping system shall be Certa-Lok C900/RJ system, as manufactured by CertainTeed, Valley Forge PA, or approved equal.
  - 1.2.7. Link Assembly: Seal annular space for piping passing through walls with interlocking synthetic rubber link assembly, Link-Seal® as manufactured by PSI-Thunderline Corporation, Houston TX, or approved equal.

## 2. Trenchless Piping Installation

- 2.1. It is the desire of the system owner to assure that trenchless piping installation be completed in a timely, quality and accurate manner utilizing good, well-maintained equipment and trained competent personnel. Trenchless piping must be installed on a route as close to the drawings as possible to prevent interference with buried utilities and other obstructions, and to prevent future accidental excavation damage.
- 2.2. Trenchless piping installation shall only be allowed if previously approved by system owner.
- 2.3. Directional drilling and pipe installation shall be done only by an experienced operator specializing in directional drilling and whose key personnel have at least five (5) year experience in this work.
- 2.4. Pipe installed by the directional drilled method must be located in plan as shown on the Drawings, and must be no shallower than shown on the Drawings unless otherwise approved. The actual horizontal and vertical alignment of the pilot bore

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shall be plotted at intervals not exceeding twenty (20) feet. This "as built" plan and profile shall be updated as the pilot bore is advanced. Instrumentation shall be utilized at all times that will accurately locate the pilot hole and measure drilling fluid flow and pressure.

- 2.5. Pilot hole shall be drilled on bore path with no deviations greater than 5 feet left/right/depth over a length of 100 feet. In the event that pilot does deviate from bore path more than this amount, the Engineer shall be notified and Engineer may require the pilot drill to be pulled back and redrilled from the location along bore path before the deviation. The final exit point of pilot hole shall be within five (5) feet of the location shown on the drawings.
  - 2.6. Trenchless piping installed using directional drilling equipment shall be installed in full compliance with restrained joint piping system manufacturer's instructions.
  - 2.7. Field grooving tools, pulling heads, spline insertion tools, etc. shall be piping system manufacturer's standard.
  - 2.8. Comply with piping system manufacturer's requirements on maximum pulling force, minimum bend radius, maximum deflection, etc. During pull-back operations, no more than the maximum safe pipe pull pressure shall be applied at any time. Maximum allowable tensile force imposed on the pull section shall be equal to, or less than 80% of the pipe manufacturer's safe pull (tensile) strength.
  - 2.9. Provide pressure relief holes at close enough intervals to prevent buckling of pavement/sidewalks. If damage does occur, the pavement shall be repaired in accordance with pavement details provided.
  - 2.10. Trace wire shall be pulled with pipe, without splices. Upon completion of installation, a continuity test on the wire shall be performed and all breaks shall be repaired.
3. Pipe Separation
- 3.1. Finished pipe installation shall have minimum 12" separation to all other utilities.
  - 3.2. Maintain at least a ten foot (10') horizontal separation of water mains from any existing or proposed sanitary sewer. The distance must be measured edge to edge. Installation of the water main closer to a sanitary sewer is acceptable where the water main is laid in a separate trench or on an undisturbed earth shelf located on one (1) side of the sanitary sewer at an elevation so the bottom of the water main is at least eighteen inches (18") above the top of the sanitary sewer.
  - 3.3. Provide a minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sanitary sewer where water mains cross the sanitary sewer mains. This shall be the case where the water main is either above or below the sanitary sewer. At crossings, one (1) full length of water pipe must be located so both joints will be as far from the sanitary sewer line as possible. Special structural support for the water and sanitary sewer pipes may be required.
  - 3.4. Provide at least a ten-foot (10') horizontal separation between water mains and sanitary sewer force mains. There shall be an eighteen-inch (18") vertical separation at crossings
  - 3.5. Locate water mains so that they do not pass through or come in contact with any sanitary sewer manhole
  - 3.6. Consult the system owner where above conditions cannot be met.

#### 4. Backfill

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- 4.1. Rough final grading of subgrade and the placement of final topsoil shall be detailed on the drawings.
  - 4.2. All sidewalks, paving, etc. which are removed or damaged during construction shall be replaced and shall match existing.
5. Testing
- 5.1. See section 331300 Disinfecting for cleaning and disinfection requirements.
  - 5.2. Piping Tests: Leak and pressure tests shall follow procedures outlined in AWWA M23. Conduct piping tests before joints are covered. Use only potable water.
  - 5.3. Simultaneous Tests: Conduct leak and pressure testing at the same time. All tests shall be conducted in the presence of the Owner's Representative. Test at not less than 100 psig for 1 hour.
  - 5.4. Test Report: Submit Test Reports to the Owner's Representative.
6. Cleaning
- 6.1. See section 331300 Disinfecting for cleaning and disinfection requirements.
7. Commissioning
- 7.1. System shall be placed in operation only after testing shows the absence of bacteriological contamination and approved by system owner.
  - 7.2. MU: Only Campus Facilities - Energy Management Steam and Water personnel will be allowed to operate valves on new water systems.

## REFERENCES

Section 331300 Disinfecting