

336000 Hydronic & Steam Energy Utilities

Sections Included In This Standard:

- 1.1 Identification of Underground Utilities and Piping
- 1.2 Piping
- 1.3 Pressure Testing
- 1.4 Insulation
- 1.5 Manholes and Structures
- 1.6 Wet Taps
- 1.7 Metering
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1.1 IDENTIFICATION OF UNDERGROUND UTILITIES AND PIPING

- A. **WARNING TAPE:** All underground piping and utilities shall have non-detectable warning tape that conforms to the following requirements to identify the specific system buried below. Warning tape shall meet OSHA regulation 1926-956 (C) (I). Tape shall be 6" wide with black lettering imprinted on a color coded background that conforms to APWA color code specifications. Tape shall be installed between 18" to 30" above the top of the pipe and a minimum of 6" below grade.
- B. **TRACER WIRE:** All non- metallic pipes installed underground (except pipe containing electric wires and traceable communication lines) and all piping installed 6 feet or more below grade shall have a tracer wire installed along the length of the pipe. The tracer wire shall be taped to the pipe and not allowed to "float freely" within the backfill. The tracer wire shall be continuous without splicing from access point to access point along the length of the pipe. The tracer wire shall be accessible at all structures (valve boxes, meter pits, manholes, pull boxes, lift stations) along the length of the pipe. The tracer wire shall have an access point at the beginning and ending points of the pipe run with no distance between access points to exceed 400 feet within the pipe run. The tracer wire shall have a color coded jacket as follows:

Steam and Chilled Water – Black Jacket

Tracer wire for piping less than 12" diameter shall be a #12 AWG and for piping greater than 12" diameter or 6 feet or more below grade shall be a #10 AWG and HS-CCS high-strength copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, rated for direct burial use at 30 volts. HS-CCS conductor must be 21% conductivity for locating purposes, Break load 380# minimum. HDPE insulation shall be RoHS compliant and utilize virgin grade material. Insulation color shall meet the APWA color code standard for identification of buried utilities. Tracer wire shall be *Copperhead™* HS-CCS HDPE 30 mil insulation or *pre-approved* equal and made in the USA. Any disturbance of this tape requires replacement after work is completed.

1.2 PIPING

- A. **CHILLED WATER PIPING**
 - 1. Chilled water pipe shall be ASTM A53, Grade B, Standard Weight, Type E or S.
 - 2. No PVC piping may be used for chilled water lines.

3. **Underground Burial Requirements:** The minimum depth of burial for chilled water piping shall be 30" to the top of the pipe. Bedding prior to installing piping shall be of clean sand, free of clay, roots, rocks, etc. A minimum of 6" under and on each side, 12" of coverage on top compacted before backfill is installed.
4. **THRUST RESTRAINTS:** Absent the use of mechanical connections on fittings at changes in direction, properly sized concrete thrust blocks shall be installed. To facilitate ease in the future removal of thrust blocks, the affected piping shall be wrapped in 6 mil polyethylene film (Visqueen) prior to pouring the thrust block.
5. **VALVES:** Butterfly valves installed on horizontal piping should have their shafts oriented horizontally.

B. STEAM & CONDENSATE PIPING

1. **Steam & Condensate:** Steam lines shall be a minimum of Schedule 40, seamless black steel pipe. Condensate lines shall be a minimum of Schedule 80, seamless black steel pipe. No copper or fiberglass piping may be used for steam supply or condensate return lines. Copper pipe can only be used for control tubing 3/8" and smaller for the steam pressure reducing valve.
2. **Preferred Piping Configuration:** Conduit systems are the preferred configuration for steam and condensate piping. This type of piping system entails the separate piping for steam and condensate described above surrounded with mineral wool insulation and enclosed within an epoxy coated steel or PVC conduit.
3. **Minimum Depth of Burial:** Minimum backfill cover for steam and condensate lines shall be 4' to the top of pipe.
4. **Drain Valves:** Add 3/4" minimum drain valves at strategic locations on both sides of main valves, in manholes, to allow system draining.
5. **Steam Traps:** Refer to Section 23200 for steam trap requirements.
6. **HEATING WATER SYSTEMS:** Heating hot water lines shall remain within the building envelope (not run on the exterior of, or between, buildings).

1.3 PRESSURE TESTING

A. GENERAL

1. All testing shall be performed to ASTM/ASME Standards.
2. Testing shall not exceed the maximum test pressure of any vessel, pump, valve, or other component in the system under pressure.
3. Test pressure shall hold for a minimum of four hours with 4" diameter, 0-300 psi range pressure gauges.
4. PPD shall witness pressure tests and retesting will be required if initial test fails.

B. HYDROSTATIC PRESSURE TESTING

1. Following the application of hydrostatic pressure test for at least 10 minutes, examination shall be made for leakage of the piping, joints, and connections. If leaks are found, they shall be eliminated by tightening, repair, or replacement as appropriate, with the hydrostatic test repeated until no leakage is found.
2. Pressure test shall not exceed 1.5 times the design pressure.

C. PNEUMATIC PRESSURE TESTING

1. All new steam and condensate piping shall be air tested before being put into service.
2. Pneumatic pressure testing shall otherwise be used only within the following limitations:
 - (a) The piping system does not contain cast iron pipe or plastic pipe subject to brittle failure.
 - (b) The system does not contain soldered or solvent cement joints over NPS 2.
 - (c) The system will be used for gas service, or for other reasons cannot be filled with water.
 - (d) Traces of test liquid would be detrimental to the intended use of the piping.
3. The test pressure shall not exceed 1.25 times the design pressure. Pressure shall be applied in several stages, allowing time for the system to reach equilibrium at each stage.

1.4 **INSULATION**

The following are the minimum insulation requirements for piping. Refer to section 331000 for insulation requirements for domestic water and process water piping.

A. CHILLED WATER PIPING

1. Provision Requirement: All chilled water piping shall be insulated so as to prevent moisture condensation on exterior surfaces. If condensation occurs at any time during the warranty period, the constructor shall be required to re-work the insulation until satisfactory, at no additional expense to owner. In exposed locations where insulation may be subject to damage, specify a protective aluminum jacket cover.
2. Above Ground: Use foam glass pipe insulation.
 - a) Pipe size smaller than 6": 1-1/2" thick minimum.
 - b) Pipe size 6" and larger: 2" thick minimum.
3. Underground: Minimum 2" thick foam glass, with Pittwrap, or equal, for water barrier.
4. All piping runouts for gauges, thermometers, auto air vents, drains, etc. shall be insulated and sealed with rubber insulating material.

B. STEAM & CONDENSATE PIPING

1. Underground: Pre-insulated piping and conduit shall have either calcium silicate insulation, minimum 3" thick for steam piping and minimum 2" thick for condensate piping or foam glass insulation wrapped with glass fabric cloth and with proper mastics.
 2. Above Ground: Use calcium silicate piping insulation, minimum 3" thick for steam, 2" for condensate.
 3. Runouts: Piping runouts through 12 feet in length and 2" in diameter may have insulation thickness 1/2" less than indicated above.
 4. Attachments for the insulation below grade: stainless steel wiring, bands, or 16 gauge copper wire, on 9" centers.
- C. HEATING HOT WATER SYSTEMS: Use fiberglass pipe insulation for hot water supply and return.
- D. REFRIGERATION PIPING
1. All piping shall be insulated with ARMAFLEX PIPE INSULATION (TUBE). In all cases, butt joints and seams are to be sealed with Armaflex 520 Adhesive or, where a low V.O.C. adhesive is required, Armaflex 520 BLV Adhesive. 520 Adhesives are contact adhesives; therefore, in all cases, both surfaces to be joined are coated with adhesive.
 2. Nominal wall (insulation) thickness not less than 3/4".
 3. Refrigeration tubing/pipe sizes not to exceed 1". If greater than 1", use foam glass.
 4. Required hangers/straps: Armaflex Insulation Pipe Hangers (IPH) and Nonhalogen Insulation Pipe Hangers (NPH).
 5. All locations where insulation may be subject to damage (to include damage from exposure to UV rays), must specify a protective aluminum jacket cover.

1.5 **MANHOLES AND STRUCTURES**

A. GENERAL

1. All manholes and underground utility structures shall either be constructed with precast concrete units or reinforced cast-in-place concrete.
2. All manhole openings shall be installed so as to minimize surface water intrusion through the lid.
 - (a) In grassed areas, the opening shall be 3" above surrounding grade with a continuous gradual slope down from the opening; maximum slope is 1" per foot.
 - (b) In paved areas, the opening shall be 1" above the surrounding grade with a continuous gradual slope down from the opening; maximum slope is 1/3" per foot.

B. STRUCTURAL REQUIREMENTS

1. Manholes and underground utility structures shall be designed by an engineer

registered in the State of Florida based on ASTM C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures with A-16 (AASHTO HS20) wheel loads. An additional load case consisting of A-12 (AASHTO HS15) wheel loads with 1/3 of the ASTM C857 impact and with Live Load Spacing of 32 inches rather than 4 feet shown in ASTM C857 Figure 1 shall also be considered.

2. As an alternate, precast, and reinforced cast-in-place, concrete manholes and underground utility structures with top slabs not longer than 48 inches maximum inside dimension conforming to the 2008 Florida Department of Transportation Design Standards Index No. 200 and Index No. 201 may be utilized without design by an engineer registered in the state of Florida.
3. Joints between precast units shall be made using "Ram-Nek" sealant.

C. CHILLED WATER MANHOLES

1. Minimum Size and Clearance: Minimum size manhole shall be 9' x 9' x 9', with at least 2' clearance between pipe/valves and parallel wall.
2. Waterproofing: Specify exterior bituminous coating to prevent infiltration.
3. Ladder: Provide an integral galvanized ladder.
4. Sump: Manholes shall have a 12" x 12" x 12" sump located beside the ladder.
5. Covers: Lid size should allow removal and replacement of all equipment. Minimum lid size shall be 24" minimum diameter. Lid should read "Chilled Water."
6. Vents, Drains, and Pressure Gauges: Vents (1/2 in.), Drains (1" min.) and pressure gauges shall be located on each side of the valves in manholes.
7. Valve Access: All chilled water valves should be located in a manhole. Manholes shall be laid out such that valves can be operated without needing a ladder to access the valves. Valves 5 inches and up shall be gear driven. Valves 4 inches and smaller shall have a stainless lever shaft and an operator.

D. STEAM & CONDENSATE MANHOLES

1. Minimum Size: Steam and condensate manholes shall be a minimum size of 9' x 9' x 9'.
2. Number of Exits: Steam and condensate manholes shall have a minimum of two exits.
3. Waterproofing: Specify exterior non-bituminous petroleum product coating on manholes to prevent infiltration.
4. Ladders: Steam and condensate manholes shall have a galvanized ladder installed at each of the two required exits.
5. Sump: Manholes shall have a 12" x 12" x 12" sump directly below pumping ring.
6. Covers: Manhole lids shall be perforated, with the ring having a diameter of 22" to 24" (or larger, if necessary to service, remove, or install equipment). Lids to read "Steam."
7. Valve Access: Manholes shall be laid out such that valves can be operated without

needing a ladder to access the valves.

1.6 WET TAPS

See section 336000 for information specific to wet taps for sanitary sewer force mains and potable, fire, and irrigation water.

- A. GENERAL: Wet tapping may be performed on heating hot water lines and certain chilled water lines. Any connections to chilled water lines that are direct burial (not in a manhole) shall be welded. Wet taps of chilled water lines may only be performed inside of manholes or machine rooms. All wet tapping shall be coordinated with PPD Operations Engineering.
- B. BUILDER'S EQUIPMENT: Tapping or drilling machine shall have the following features:
 - 1. Automatic feed indicator to show the exact position of the drill at all times.
 - 2. Automatic over-travel protection to prevent the cutter from going through the back side of the main.
 - 3. Automatic disengagement protection.
 - 4. Shell cutters shall be 1/2" undersized.
- C. MATERIALS
 - 1. Tapping sleeves for chilled water and steam: Use a double disc-tapping valve, a resilient seat, or wedge-tapping valve only.
 - 2. Chilled Water Lines: Use weld-o-lets with outlet size of 2½ inches and larger. Thread-o-lets or sock-o-lets with an outlet size of 2 inch and smaller may be used for branch takeoffs up to one-half the diameter of main. Use thread-o-lets where threaded fittings are specified and sock-o-lets where welded fittings are specified. The material of the thread-o-let and sock-o-let shall match the material of the piping.
- D. EXECUTION
 - 1. After installing the sleeve, and prior to drilling, the Builder shall pressure test the installed material, using chlorinated water.
 - 2. If thrust blocks are needed, they shall not be installed until after the tap has been made. Pipe shall be wrapped with a visqueen liner before cement is poured so concrete does not adhere to pipe.
 - 3. Do not backfill until inspected by PPD Operations Engineering.

1.7 METERING

- A. See section 253000 for chilled water, heating hot water, and steam metering requirements.

1.8 DISINFECTION OF WATER DISTRIBUTION SYSTEMS

- A. GENERAL: All piping for water distribution systems shall be cleaned and tested.
- B. Specify thorough flushing, and cleaning with a "Polly Pig" where necessary. Sterilization and pressure testing procedures shall be explicitly specified and shall comply with the

appropriate AWWA standard and State of Florida Health Standards.

- C. Water samples shall be tested at HRS/Alachua County Public Health Unit, Environmental Health Division in Gainesville. Currently a fee is charged for this test. Test results are to be forwarded to the UF Project Manager and PPD before service is turned on. A representative from PPD must be present during the water sampling – no exceptions.
- D. STEAM & CONDENSATE PIPING
 - 1. Condensate Purity: Condensate shall meet strict purity standards before being introduced to the condensate return system. Accordingly, when new steam or condensate piping is installed, the condensate shall permanently be piped from the condensate receiver drain to the sanitary sewer with an isolation valve at the condensate receiver and a sample port in the line until it reaches the required purity. Plans must show piping to sewer, valves, tees, and sample ports, as needed. PPD shall do condensate sampling.
 - 2. Prior to being placed into service, new steam and condensate lines should be cleaned by free-blowing with steam. Design should include all provisions for free blowing, including temporary connections from the steam to the condensate piping as applicable. Contact PPD to inspect and approve connections for the free-blowing test. If the testing process could potentially be disruptive to classes or other operations, then testing shall be conducted during off hours.

END OF SECTION