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33 6313 – Underground Heating and Chilled Water Distribution Piping

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SECTION 33 6313 – UNDERGROUND HEATING AND CHILLED WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes underground factory pre-insulated piping outside the building for distribution of heating hot water, chilled water and dual-temperature water services that is direct-buried, in concrete walk-thru pipe tunnels, and shallow-bury concrete pipe chases where there is no steam present. It is not applicable for above ground installations.
- B. If steam piping is present in the tunnel or chase, then the heating and chilled water piping will have a spiral wound aluminum jacket.

1.2 RELATED SECTIONS FOUND ELSEWHERE

- A. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.
- B. See Chapter 5, Division 23, Section 231800, for requirements related to district heating and cooling plant requirements.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- B. Most recent editions of applicable specifications and publications of the following organizations:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. American Welding Society (AWS).
 - 4. National Association of Corrosion Engineers (NACE).
- C. The manufacturer of the conduit system is responsible for the complete design of the system, the product to be supplied, fabrication, witnessing installation and testing of the system. The complete design of the system shall be prepared, signed and sealed by a registered professional engineer employed by the system manufacturer.
- D. Installer: Company specializing in performing the work of this section with minimum ten years of experience. Welders: Certify in accordance with ASME SEC 9 and AWS D1.1.



PART 2 - PRODUCTS

2.1 MANUFACTURERS

- a. Rovanco Piping Systems, Inc.
- b. Insul-Tek Piping Systems, Inc.
- c. Perma-Pipe, Inc.

2.2 PREINSULATED UNDERGROUND PIPING SYSTEM

A. General: Underground pre-insulated heating hot water, chilled water and dual-temperature water distribution piping. Piping shall be furnished with high-density polyethylene jacket, polyisocyanurate foam, and steel carrier pipes. Straight sections, fittings, anchors and other accessories shall be factory pre-insulated to job dimensions and designed to minimize the number of field welds. Where possible, straight sections shall be supplied in 40-foot random lengths with 6 inches of exposed piping at each end for field fabrication. Each system layout shall be computer analyzed by the piping system manufacturer to determine the stresses and movements of the service pipe. The system shall be in strict conformance with ANSI B31.1 latest edition. Submittal drawings and stress-analysis calculations shall be stamped by a New Hampshire registered professional engineer.

B. Carrier Pipes: Carrier pipe shall be schedule 40 black steel, ASTM A53, Grade B, ERW for nominal sizes up to and including 10 inches, and standard weight steel (0.375" wall), ASTM A53 Grade B, ERW for sizes 12" and larger.

C. Carrier Pipe Insulation:

Carrier pipe insulation shall be foamed-in-place HT-300 closed cell polyisocyanurate foam, as manufactured by HiTherm, LLC, and capable of continuous operating temperatures of 300 °F with intermittent service to 350 °F.

The minimum carrier pipe insulation thickness shall as specified below:

Carrier Pipe Size	Minimum Thickness
2"	1.91"
2-1/2"	1.66"
3"	2.07"
4"	1.57"
5"	2.04"
6"	1.51"
8"	1.72"
10"	1.48"
12"	1.38"
14"	1.74"
16"	1.70"
18"	1.88"



- D. Outer Jacket: Preformed heavy-duty seamless High-Density Polyethylene (HDPE) casing conforming to ASTM D3350-12, minimum cell classification of PE334360C, and containing a minimum of 2% carbon black. Minimum wall thickness shall be 175 mils. Spiral wrap or jackets extruded over the insulation are not acceptable.
 - 1. The minimum outer jacket size and wall thickness shall be as specified below:

Carrier Pipe Size	Minimum Jacket Size
2"	6.60"
2-1/2"	6.60"
3"	8.00"
4"	8.00"
5"	10.00"
6"	10.00"
8"	12.43"
10"	14.06"
12"	15.87"
14"	17.83"
16"	19.80"
18"	22.17"

- E. Outer Jacket Closures:
 - 1. Carrier pipe insulation shall be two-part foamed-in place polyisocyanurate foam of the same thickness as pre-insulated units.
 - 2. Inner jacket casing closures shall consist of HDPE molds in cylindrical form with one horizontal split.
 - 3. After successful completion of testing, cover exposed closures in the field with cross-linked high-density polyethylene heat shrink material.
- F. Fittings: elbows and tees shall be factory pre-insulated same as to match straight sections of pre-insulated pipe.
 - 1. Elbows shall be long-radius forged steel, butt weld type. Fittings may also be bent pipe equal to the carrier pipe and to the same dimensions as long-radius forged fittings.
 - 2. Tees shall be forged steel, butt weld type.
- G. Expansion Loops and Elbows:
 - 1. Expansion loops and expansion elbows shall be determined and designed by the manufacturer. The manufacturer shall submit for approval a complete stress analysis calculation supporting their design.
 - 2. Expansion loops and expansion elbows shall be pre-insulated and furnished and enclosed in the same type of casing as those furnished for the standard straight sections of the system.
 - 3. Expansion loops and elbows shall be wrapped with elastomeric foam expansion pads field applied to the appropriate thickness as determined by the pre-insulated piping manufacturer.



4. Expansion loops and expansion elbows shall be pre-insulated and shipped to the job site in as few pieces as possible, in accordance with manufacturer's recommendations.
- H. Anchors:
 1. Anchors shall be prefabricated onto the piping units and shall be fabricated from 1/2 inch thick steel plate conforming to ASTM A36.
- I. End Seals:
 1. Terminal ends of conduit system inside manholes, pits, or building walls shall be equipped with field-applied heat-shrink end seals.
- J. Terminate conduits 2 inches beyond the inside face of entry walls to protect any exposed pipe insulation from damp wall condensation.

2.3 WALL PENETRATIONS AND WALL SEALS

- A. Wall penetrations shall be made using the core-drilling method. The penetration opening size shall be selected to coordinate with the proper size and number and temperature rating of modular rubber seals recommended by the supplier. Steel wall sleeves shall not be permitted.

PART 3 - EXECUTION

3.1 GENERAL

The conduit system manufacturer shall oversee the delivery, storage, installation and testing of the system.

3.2 PREPARATION

- A. Ream pipe and tube ends, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale or dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION

- A. Handle the system in accordance with the directions furnished by the manufacturer and as approved by the Engineer.
- B. Install pipes in accordance with the manufacturer's drawings and details. The installation



shall be in accordance with the manufacturer's recommendations.

- C. Extend the piping thru building and manhole envelope walls and terminate with end seals.
- D. Install piping to allow for expansion and contraction without stressing the pipe, joints, or connected equipment.
- E. Install valves with stems upright or horizontal, not inverted.
- F. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flange, union and couplings for servicing are consistently provided and accessible.
- G. In the erection of mains, use special care in the support, working into place without springing or forcing, and make proper allowance for expansion.
- H. Anchor, guide and otherwise support piping, where necessary to prevent vibration or to control expansion.
- I. Make such offsets as are indicated and required to place the pipes and risers in proper position to avoid other work.
- J. Remove standing water in bottom of trench.
- K. Do not backfill piping trench until field quality-control testing has been completed and results approved.
- L. Install drains, consisting of a thread-o-let, NPS 1-1/2 (DN20) ball valve, and short NPS 1-1/2 (DN20) threaded nipple (Sch 80), at low points and elsewhere as required for system drainage.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Secure anchors with concrete thrust blocks.
- P. Flush pipes prior to connecting to the building or manhole interior pipes.
- Q. Install continuous plastic underground warning tapes during backfilling of trenches. Locate tapes 6 to 8 inches (150 to 200mm) below finished grade, directly over piping.

3.4 EXCAVATION, TRENCHING, AND BACKFILLING

- A. Perform excavation, trenching, and backfilling as required by the system manufacturer's design and as specified in other Sections.
- B. Beach sand or any sand with large amounts of chlorides shall not be permitted. Place



system on a 4 to 6-inch thick sand bed and backfill on all sides with 12-inch thick sand as measured from the outside of the conduit casings. Backfill with 12-inch thick sand over top of conduit casing, as measured from outside of largest conduit.

- C. Foundation and backfill must be free from rocks or substances that could damage the system coating.
- D. Pressure test the carrier pipes to the satisfaction of the manufacturer's representative.

3.5 FIELD SERVICE INSPECTION

- A. A field service representative, who is certified in writing by the conduit manufacturer to be technically qualified and experienced in the installation of the system, shall be present on the job site for a minimum of 3 visits. The field service representative shall be present when the following work is performed.
 - 1. Unloading and the inspection of the first truckload of pipe.
 - 2. Inspection of the trench.
 - 3. Inspection of anchors and concrete thrust blocks.
 - 4. Field joint closure, initial instruction.
 - 5. Final walk though and end termination inspection in all manholes and buildings.

3.6 TESTING

- A. Testing agency: Owner will engage a qualified testing agency to perform X-ray tests and inspection on each and every field weld. Pre-insulated piping manufacturer shall also engage a qualified testing agency to perform X-ray tests and inspection on each and every shop weld.
 - 1. The General Contractor and their Subcontractors shall be responsible for providing the following assistance to the testing agency.
 - a. Provide access to the Contractor's on site ladders and man-lifts as required to allow access to required testing equipment by the Testing Agency.
 - b. Keep the Testing Agency informed of the project schedule and access to systems before otherwise obstructed.
 - c. Ensure adequate time is allotted in the project schedule to allow for the proper testing.
 - d. Coordinate with the Testing Agency to correct system deficiencies that are discovered by the Testing Agency. Notify the Testing Agency once the deficiencies are corrected.
- B. Hydrostatically test carrier pipes at 1-1/2 times system design pressure or 150 psig, whichever is higher, for a period of no less than 4-hours prior to insulating joints and closing outer conduit casing. Repair leaks by welding and retest the system. All tests to be witnessed by owner or owner's representative.

END OF SECTION 33 6113