

## SECTION 15524 – UNDERGROUND HYDRONIC PIPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Pre-insulated Underground Piping System.
- B. Installation procedure for the complete underground piping system furnished and installed by the Mechanical Contractor.

#### 1.2 RELATED SECTIONS

- A. Section 15190 - Mechanical Identification.
- B. Section 15520: Steam and Condensate Heating Piping.

#### 1.3 REFERENCES

- A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B31.9 - Building Services Piping.
- C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- D. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation.
- E. AWS D1.1 - Structural Welding Code.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01 Section “Submittal Procedures”.
- B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide Manufacturers catalogue information. Indicate valve data and ratings.
- C. Welder’s Certificate: Include welder’s certification of compliance with ASME SEC 9. and AWS D1.1.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

#### 1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01 Section “Closeout Procedures.”

- B. Record actual locations of valves.

#### 1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 01 Section "Operation and Maintenance Data."
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years experience.
- C. Welders: Certify in accordance with ASME SEC 9. and AWS D1.1.

#### 1.8 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01 Section "Product Requirements."
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

### PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Perma-Pipe/Ricwil.
- B. No substitutions.

2.2 PREINSULATED UNDERGROUND PIPING SYSTEM

- A. Perma-Pipe/RICWIL Multi-Therm 500 Pre-insulated Underground Piping.
- B. General: Underground heat distribution lines shall be fiberglass jacketed steel conduit. Straight sections, fittings, anchors and other accessories shall be factory prefabricated to job dimensions, and designed to minimize the number of field welds. Each system layout shall be computer analyzed by the piping system manufacturer to determine stresses and movements of the service pipe. The system design shall be in strict conformance with ASME B31.1 latest edition, and stamped by a registered professional engineer. Factory trained field technical assistance shall be provided for the critical periods of the installation: for example, unloading, field joint instruction and testing.
- C. Service Pipe:
  - 1. Internal piping shall include both a steam supply line and a pumped condensate return line within a single steel conduit. Steam piping shall be schedule 40, ASTM A53 Grade B seamless steel, suitable for use with high pressure steam systems. Steam condensate return piping shall be schedule 80, ASTM A53 Grade B seamless steel.
- D. Joints shall be butt welded for sizes 2-1/2 inches (63.5 mm) and larger, and socket welded for sizes 2 inches (50.8 mm) and smaller. Wherever possible, straight sections shall be supplied in 40 foot (12.2 m) random lengths with 6 inches (152 mm) of piping exposed at each end for field joint fabrication.
- E. Subassemblies: End seals, gland seals and anchors shall be designed and factory prefabricated to prevent the ingress of moisture into the system. Subassemblies shall be designed to allow for complete draining and drying of the conduit system.
- F. Service Pipe Insulation: Insulation shall be mineral wool as manufactured by Pittsburgh Corning Corporation. The insulation shall be fabricated in half, curved sidewall, V-Groove insulation sections. The bore coating shall be Hydrocal B-11 gypsum cement, manufactured by U.S. Gypsum Corporation. The insulation shall be secured to the pipe by stainless steel bands. Insulation thickness shall be as indicated.
  - 1. Outer Conduit:
  - 2. The steel conduit casing shall be smooth wall, welded steel conduit of the thicknesses specified below:

Conduit Size	Conduit Thickness
6" - 26" (152 mm - 660 mm)	10 Gauge
- G. Changes in casing size, as required at oversized casing to allow for carrier pipe expansion, shall be accomplished by eccentric and/or concentric fittings and shall provide for continuous drainage.

- H. Pipe Supports: Provide pipe supports within the outer casing shall be supported at no more than 10 foot (3 m) intervals. These supports shall be designed to allow for continuous airflow and drainage of the conduit in place. The straight length supports shall be designed to occupy not more than 10% of the annular air space. Supports shall be of the type in which insulation thermally isolates the carrier pipe from the outer conduit. The surface of the insulation shall be protected at the support by a sleeve not less than 12 inches (305 mm) long, fitted with transverse and, where required, rotational arresters.
- I. Outer Conduit Insulation And Jacket:
1. Conduit insulation shall be spray-applied polyurethane foam, having a nominal 2 pound per cubic foot (32 kg/m<sup>3</sup>) density for straight lengths and fittings. The insulation thickness shall be 1 inch (25.4 mm). Quality assurance procedures for the insulation shall include either a visual check prior to jacketing or infrared, or x-ray of the entire length, to insure there are no insulation voids. The urethane foam shall meet ASTM C591 and shall have minimum characteristics of 0.14 K-factor and a closed cell content of 90 to 95%.
- J. The outer conduit shall be fiberglass (FRP) and shall be filament wound directly onto the urethane foam insulation. No PVC or Polyethylene jackets shall be allowed. Straight lengths and fittings shall be factory jacketed.

## PART 3 - EXECUTION

### 3.1 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 and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems.

### 3.2 INSTALLATION

- A. Handle the system in accordance with the directions furnished by the manufacturer and as approved by the Engineer.

The installation shall be in accordance with the manufacturer's recommendations. The Perma-Pipe/Ricwil piping system shall extend underground low pressure steam and condensate to above ground as shown on in section on DWG DWG M-31.1 Detail B2 detailed by the following Perma-pipe 81/2x11 details:

- DWG MT-10005 Cross Section Tabulation Detail
- DWG MT-1130 Watershed Assembly Detail
- DWG MT-1190 Conduit Vent & Drain Detail
- DWGMT-1210 Elbow Assembly Detail.

- B. Extend the piping system through the building envelope wall and terminate with either a gland seal or end seal as required per manufactures recommendation.
- C. Backfill: A four inch layer of sand or fine gravel shall be placed and tamped in the trench to provide uniform bedding for the system. The entire trench shall be evenly backfilled with a similar material as the bedding in six inch compacted layers to a minimum height of 6 inches above the top of the insulated piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil.

### 3.3 FACTORY TRAINED FIELD TECHNICAL ASSISTANCE

- A. A factory trained field representative shall be present to inspect and lend technical assistance during the following phases of construction.
  - 1. One site visit when materials have been delivered and unloaded. The representative shall inspect to ensure that materials have been delivered and are in satisfactory condition for installation. The representative shall also discuss installation procedures with the installing Subcontractor and shall answer Contractor-s questions.
  - 2. One site visit when welding of service pipe joints steam and condensate is complete and service pipe is being pressure tested. The representative shall inspect field joints in the service pipe and shall verify pressure testing of service pipe. Once the pressure testing of the service pipe is complete, the representative shall assist and instruct the Contractor in the installation of service pipe insulation and outer steel conduit for one (1) field joint.
  - 3. One site visit when installation of outer steel conduit at field joints is complete and outer steel conduit is being pressure tested. The representative shall inspect outer steel conduit field joints and shall verify pressure testing of outer steel conduit. Once the pressure testing of the outer steel conduit is complete, the representative shall assist and instruct the Contractor in the installation of the polyurethane insulation and outer FRP jacket for one (1) field joint.

### 3.4 CLEANING

- A. Flush buried Perma-Pipe/Ricwil conduit system pipes prior to connecting to the building interior pipes.

### 3.5 TESTING

- A. General:
  - 1. Test conduit, pipes, pipe joints and pipe covering.
  - 2. Perform testing and obtain approval from the Architect/Engineer before covering or concealing piping.
- B. Service Pipe Joint-Weld Test: Ferrous pipe field joints shall be welded by certified welders and hammer tested under hydrostatic pressures of 250 psig (1724 kPa) or twice the working pressure, whichever is greater. Concealed pipe joints in prefabricated conduit fittings shall be factory-tested the same as specified for field joints prior to assembly.
- C. Service Pipe Test:
  - 1. Test pipes for leaks per Perma-Pipe/Ricwil testing standards.
  - 2. Test condensate return and pumped condensate return piping hydrostatically to one and one-half times the maximum systems operating pressure, but in no case to less than 75 psig (517

kPa), for at least 30 consecutive minutes, during which time pressure shall remain constant without pumping.

D. Outer Conduit Air Test:

1. Test field welds at outer conduit closures for leaks before applying Rip-Coat Coating and Rip-Coat Blanket. During test, check field welds with soap suds, and rewelded if necessary, until airtight at 15 psig (103 kPa) pressure.
2. Furnish necessary equipment and labor to perform the air test, including air compressor, gauges, conduit caps, temporary pipe and connections, and other accessories, and complete the test to the satisfaction of the Engineer.

E. Holiday Detector Test: After installation of conduit and prior to backfilling, the waterproofed exterior surfaces, including field joints, shall be tested for holidays by the conduit manufacturer's Field Service Representative. The tests shall be accomplished with a silicone rubber electric wire brush, or a coil probe testing set, with an operating bell, buzzer or other suitable signal which will sound when a holiday is detected at 10,000 crest voltage + 5%. The tester shall be a type so fixed that field adjustment cannot be made.

### 3.6 BACKFILL

- A. Place and tamp a 4 inch (102 mm) layer of sand or fine gravel in the trench to provide a uniform bedding for the system. Evenly backfill the trench with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches (152 mm) above the top of the insulated piping system. Backfill the remaining trench evenly and continuously in uniform layers with suitable excavated soil.

END OF SECTION 15524