

PRE-INSULATED DUCTILE IRON PIPE, CEMENT LINED

****From Hartford (Wilder) STP 1444(35)**

- xx. DESCRIPTION. This work shall consist of furnishing, installing, and testing pre-insulated, cement lined ductile iron pipe at the locations indicated in the Plans and as directed by the Engineer.

The work under this Section shall be performed in accordance with these provisions, the Plans, and Section 628 of the Standard Specifications.

- xx. MATERIALS. Materials shall meet the requirements of Section 628 and the following:
- (a) General. Pre-insulated pipes shall be Class 52 ductile iron pipes as specified herein. The pipe shall be insulated using the U.I.P. factory insulation process, as supplied by Urecon Ltd., complete with integral conduit for electric heat trace cable and 1.27 mm (50 mils) minimum black polyethylene jacket. Insulation of associated joints, fittings, and accessories shall be as per Urecon's recommendations, depending on the size and type of pipe involved. The product shall be manufactured in accordance to ISO 9001-2000 Standards, or approved equal.
- (b) Heat Tracing Conduit(s). Heat tracing conduit(s) shall consist of an extruded molding and shall be applied to the pipe prior to application of the insulation. The conduit(s) will be securely fastened to the pipe to prevent the ingress of foam therein during the insulation process. All conduit(s) shall be checked after insulating to insure they are not plugged. The ends shall be sealed prior to shipping to prevent any foreign material from entering the conduit while in transit or during installation.
- (c) Insulation.
- (1) Material: rigid polyurethane foam, factory applied.
 - (2) Thickness: 50 mm (2 in.) or as required.
 - (3) Density: (ASTM D 1622) 35 to 48 kg/m³ (2.2 to 3.0 lbs/ft³).
 - (4) Closed cell content: (ASTM D 2856) 90%, minimum.
 - (5) Water absorption: (ASTM D 2842) 4.0% by volume.
 - (6) Thermal conductivity: (ASTM C518) 0.020 to 0.026 W/m•°C (0.14 to 0.17 Btu•in/ft²•hr•°F).
- (d) System Properties.
- (1) System compressive strength: (modified ASTM D 1621 with 50 mil jacket) approximately 414 to 552 kPa (60-80 lbs/in²), varies with pipe diameter.
 - (2) Temperature limitations:
 - a. in service: -45° to 85°C (-49° to 185°F)
 - b. installation: -34°C (-30°F)
- (e) Outer Jacket on Pipe Insulation (with enhanced 'Cold Climate Handling' Properties).

The outer protective jacket shall consist of custom blended black polyethylene, Scapa Tape # 366, 1.27 mm (50 mils) factory applied. The

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jacket shall have a modified butyl rubber adhesive to ensure positive adhesion to the foam insulation and shall be applied hot in two counterwound and overlapping layers each 0.64 mm (25 mils) thick to ensure a shrink tightened waterproof bond throughout its entire length.

Outer jacket characteristics:

- (1) Jacket material: polyethylene UV inhibited, specially formulated for superior cold environment properties, Scapa Tape #366.
 - (2) Sealant: butyl rubber and resin.
 - (3) Jacket thickness: 1.27 mm (50 mils.)
 - (4) Minimum elongation: (ASTM D 1000) 300%, 6 month test.
 - (5) Service temperature range:
 - a. installation: -34° to 82°C (-30° to 180°F)
 - b. in service : -45° to 85°C (-49° to 185°F)
 - (6) Tensile strength: (ASTM D-1000) 6.83 kg/cm wide (38 lbs/in wide).
- (f) Insulated Pipe Joints. Insulated pipe joints shall be sealed with a 300 mm (12 in.) wide heat shrink sleeve.
- (g) Insulation Kits For Fittings. Insulation kits for fittings shall consist of rigid polyisocyanurate or urethane foam insulation with a fully bonded polymer protective coating on all exterior and interior surfaces, including ends. Kits to be supplied complete with silicone caulking for seams, stainless steel attachment straps and clips, and heat shrink sleeves to seal between pipe and insulation kit.
- (1) Rigid Polyisocyanurate Or Urethane Foam Insulation.
 - a. Density: (ASTM D1622) 27 to 32 kg/m³ (1.7 to 2.0 lbs/ft³).
 - b. Compressive strength: (ASTM D1621) 131 to 158 kPa (19 to 23 lbs/in²).
 - c. Closed cell content: 90%, minimum.
 - d. Water absorption: (ASTM D2842) 4.0% by volume.
 - e. Thermal Conductivity: (ASTM C 518) 0.027 W/m $\cdot^{\circ}\text{C}$ (0.19 Btu $\cdot\text{in}/\text{ft}^2\cdot\text{hr}\cdot^{\circ}\text{F}$).
 - f. Thickness: to match pipe insulation thickness.
 - (2) Polymer Coating, Urecon BL-75-20EP.
 - a. Two component high density polyurethane coating, black in color.
 - b. Density: 1170 kg/m³ (73 lbs/ft³).
 - c. Durometer D scale 60.
 - d. Tensile strength: 11,100 kPa (1610 lbs/in²).

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- e. Tear strength: 26.5 N/mm (151 lbs/in).
- f. Thickness: 1.9mm (75 mils) outside surfaces, 0.51mm (20 mils) inside surfaces.

xx. LAYING PIPE. Concrete reaction blocking shall be provided as detailed at all pressure pipe bends, tees, crosses, reducers, valves, caps, and plugs. Pipe joint at these fittings shall be mechanical joint with retainer glands. The use of retainer glands does not reduce the requirements for thrust restraint.

xx. TESTING OF SYSTEM. All piping shall be tested in accordance with the following test methods, in addition to any test required by State and local codes or building authorities:

(a) Pressure Pipe Testing.

(1) Leakage Test. The following procedure shall be used:

a. The allowable leakage is as follows:

(1) Leakage for buried pipe with sliptype or mechanical joints shall not exceed the rate determined by the following formula:

$$L = (S \times D \times \sqrt{P}) / 148,000$$

where:

L= allowable leakage in gallons per hour

S= length of pipe tested in feet

D= nominal diameter of pipe in inches

P= average test pressure in psi

xx. BACKFILLING.

(a) Pipe Bedding Area. Prior to laying pipe, bedding material shall be placed to the limits of the excavation and to a depth beneath the pipe as specified. This material shall be crushed gravel meeting the gradation requirements of Table 704.05A - Fine. As the pipe is laid, bedding material shall be extended to the spring line of the pipe and leveled along the width of the trench.

Where rock, boulders, or unsuitable bearing materials are not present, ductile iron pipe used for force main may be laid in the shaped trench bottom.

(b) Pipe Envelope Area. The pipe envelope for ductile iron pipe consists of selected suitable material placed from the spring line of the pipe to a depth of 300 mm (12 inches) over the top of the pipe. The pipe envelope for PVC pipe consists of crushed gravel meeting the gradation requirements of Table 704.05A - Fine placed from the spring line of the pipe to a depth of 300 mm (12 inches) over the top of the pipe. The material shall be carefully placed and spread over the width of the trench and compacted using an approved tamper.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Pre-Insulated Ductile Iron Pipe, Cement Lined) of the size specified to be measured for payment will be the number of meters (linear feet) of line installed in the complete and accepted work, as measured along the flow line of the pipe.

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xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Pre-Insulated Ductile Iron Pipe, Cement-Lined) of the size specified will be paid for at the Contract unit price per meter (linear foot). Payment shall be full compensation for furnishing, transporting, handling, installing, and testing the materials specified; for furnishing and placing concrete or other materials for reaction blocking; for making all necessary connections; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Excavation for sewer pipe, including bedding and backfill operations, and disposal of excavated material not suitable for backfill, will be paid for as follows:

- (a) For pipes and fittings, excavation bedding and backfill (including seeding and mulching) shall be included in the linear foot unit price for the specific pipe. This is valid for all excavation with the exception of rock excavation, which shall be paid for under Contract item 204.21. All backfill with the specified materials (except as detailed below) to finished grade will be included in the pipe meter (linear foot) unit price, with the exception of paving, which will be paid for under the appropriate Contract paving items.
- (b) When backfill is required to replace poor foundation material below the normal grade of the pipe, it shall be paid for at the Contract unit price per cubic meter (cubic yard) for the type of backfill specified.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.640 Special Provision (Pre-Insulated Ductile Iron Pipe, Cement Lined) (Sewer) (Water) (X mm) (X")	Meter (Linear Foot)