

DETAILED SPECIFICATION

Standard U.I.P.[®] system for below grade piping

1. GENERAL

The pipe shall be insulated using the unique U.I.P.[®] factory insulation process, as supplied by GF Urecon Ltd., complete with integral conduit(s) for electric heat trace cable (if required) and 1.27 mm (50 mils) to 2.54 mm (100 mils) black polyethylene jacket with UV inhibitor. The jacket thickness is dependent on the insulated pipe diameter and its intended function. The insulation of associated joints, fittings and accessories shall be as per GF Urecon's recommendations. The product shall be manufactured in accordance to ISO 9001 Standards, or approved equal.

2. PIPE PREPARATION

Pipe shall be cleaned of surface dust or dirt to ensure adhesion of the foam to the pipe.

3. HEAT TRACING CONDUIT

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 ensure they are not blocked. The ends shall be sealed prior to shipping to prevent any foreign material from entering the conduit while in transit or during installation.

4. INSULATION

- a) Material: Rigid polyurethane foam, factory applied.
- b) Thickness: Nominal 50.8 mm (2 in) or as required.
- c) Density: (ASTM D1622) 35 to 45 kg/m³ (2.2 to 2.81 lbs/ft³).
- d) Closed cell content: (ASTM D6226) $\geq 90\%$.
- e) Water absorption: (ASTM D2842) $\leq 4.0\%$ by volume.
- f) Thermal conductivity: (ASTM C518) 0.020 to 0.022 W/m°C (0.14 to 0.154 Btu • in/ft² • hr • °F).
- g) Temperature range: Cryogenic to 93.3 °C (200 °F).

5. SYSTEM PROPERTIES

- a) System compressive strength: (modified ASTM D1621 with 1.27 mm (50 mils) jacket) approximately 414 to 552 kPa (60-80 lbs/in²), varies with pipe diameter.
- b) Service temperature range: the overall factory insulated system limitations are dependent on the core pipe type, insulation and application.
- c) Temperature limitations: minimum ambient installation temperature -34 °C (-29 °F).

6. OUTER JACKET ON PIPE INSULATION (WITH ENHANCED COLD CLIMATE HANDLING PROPERTIES)

The outer protective jacket shall consist of either:

i.) Tape wrap system: (available from both manufacturing facilities)

- a) Jacket material: Scapa #366 polyethylene, UV inhibited, formulated for superior cold environment properties.
- b) Sealant: Butyl rubber and resin, applied hot in 0.63 mm (25 mils) multiple layers providing a shrink tightened waterproof bond throughout its entire length.
- c) Minimum elongation: (ASTM D1000) 300%, 6 month test.
- d) Tensile strength: (ASTM D1000) 6.83 kg/cm wide (38 lbs/in wide).

ii.) Extruded system: (available from Calmar, AB only)

- a) Material: Extruded black high density polyethylene copolymer, UV inhibited and factory applied;
- b) Minimum 2% carbon black, well dispersed;
- c) Density of PE base resin > 0.947 to 0.955 g/cm³ (>59.1 to 59.6 lbs/ft³) as per ASTM D1505;
- d) Melt index of compound < 0.4 to 0.15 g/10 minutes (<0.00088 to 0.00033 lb) as per ASTM D1238;
- e) Flexural modulus of compound < 1103 to 758 MPa ($<160,000$ to $110,000$ psi) as per ASTM D790;
- f) Tensile strength at yield of compound < 28 to 24 MPa ($<4,000$ to $3,500$ psi) as per ASTM D638.

Recommended PE Jacket thicknesses* for below grade applications-

Jacket OD ≤ 406.4 mm (16 in)	@ 1.27 mm (50 mils)
Jacket OD > 406.4 mm (16 in) to 609.6 mm (24 in)	@ 1.90 mm (75 mils)
Jacket OD ≥ 609.6 mm (24 in)	@ 2.54 mm (100 mils)

*other jacket thicknesses are available upon request

7. INSULATED PIPE JOINTS

a) Butt-fused and welded joints

Insulated pipe joints shall be completed using pre-fabricated rigid polyisocyanurate or polyurethane foam half shells and sealed with the application of suitable wrap around adhesive lined heat shrink sleeves as supplied by GF Urecon. The heat shrink sleeves shall overlap the insulation jacket by a minimum of 75.2 mm (3 in) on either side of the joint. The insulation shall be pre-grooved on the inside or slightly oversized to accommodate heat trace cable(s) if applicable.

b) Bell x spigot joints

Insulated pipe joints shall be sealed with a 152.4 mm (6 in) wide heat shrink sleeve or butyl mastic tape if the system is not electrically heat traced, 304.8 mm (12 in) to 609.6 mm (24 in) wide if traced, depending on pipe size.

8. INSULATION KITS FOR FITTINGS

Insulation kits for fittings shall consist of rigid polyisocyanurate or polyurethane foam half shells with a fully bonded polymer protective coating on all exterior and interior surfaces, including ends. All insulation kits shall be supplied complete with silicone caulking for seams, stainless steel bands and gear clamps.

a) Rigid polyisocyanurate or polyurethane foam

1. Density: (ASTM D1622) 32 kg/m³ (2.0 lbs/ft³).
2. Compressive strength: (ASTM D1621) 124 to 186 kPa (18 to 27 lbs/in²).
3. Closed cell content: (ASTM D2856) 90%, minimum.
4. Water absorption: (ASTM C272) 2.0% by volume.
5. K factor: (ASTM C518) 0.027 W/m°C (0.19 Btu • in/ft² • hr • °F).
6. Thickness: 50.8 mm (2 in), other thicknesses upon request, shall match pipe insulation thickness.

b) Polymer coating, GF Urecon BL-60-20EP

1. Two-component, polyurethane or polyurea black coating.
2. Density: (ASTM D1622) 961 to 1121 kg/m³ (60 to 70 lbs/ft³).
3. Hardness: (ASTM D2240) ≥ 45 Shore D.
4. Tensile strength: (ASTM D412/D2370) ≥ 12.40 MPa (1800 lbs/in²).
5. Tear resistance: (ASTM D1004) ≥ 52.54 N/mm (300 Lbf/in).
6. Thickness: 1.52 mm (60 mils) outside surfaces, 0.51 mm (20 mils) inside surfaces.

9. ELECTRIC TRACING SYSTEM

The electric tracing system and associated controls shall be as per the manufacturer's recommendations with particular attention being paid to the watt densities applied through conduits on plastic pipes. All tracing cables and related accessories to be CSA approved and comply with CSA heat tracing standard C22.2 No. 130-03. Standard of acceptance is GF Urecon's Thermocable or approved equal. Please contact your GF Urecon representative for further details and design assistance.

Note: Physical characteristics are nominal and may vary depending on pipe type and diameter.

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