DETAILED SPECIFICATION

Hi-Temp System to 149°C *(300°F)* with polyethylene jacket for above grade

1. GENERAL

It is critical that all field installed components of a Hi-Temp foam piping system be installed with special care and attention, ensuring that the system is not only insulated properly, but completely waterproof as well. Should moisture be trapped in the system by any means after commissioning, the moisture could flash off as steam, permanently damaging the insulation and jacketing.

The pipe shall be insulated using the unique U.I.P.® factory insulation process, as supplied by GF Urecon. The insulation of associated joints, fittings and accessories shall be as per GF Urecon's recommendations. All exposed ends of insulation shall be bagged with plastic or sealed with waterproof sealant prior to leaving the factory to prevent moisture ingress during shipping and storage. 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. INSULATION

a) Material: Rigid polyurethane foam, factory applied.
b) Thickness: 50.8 mm *(2 in)* or as required.
c) Density: (ASTM D1622) 38 to 56 kg/m³ *(2.4 to 3.5 lbs/ft³).*
d) Closed cell content: (ASTM D6226) 90%, minimum.
e) Water absorption: (ASTM D2842) 4.0% by volume.
f) Thermal conductivity: (ASTM C518) 0.020 to 0.026 W/m°C *(0.14 to 0.17 Btu • in/ft² • hr • °F).*
g) Temperature range: - 45°C to 149°C *(-49°F to 300 °F).*

4. SYSTEM PROPERTIES

a) System compressive strength: (modified ASTM D1621 with PE extruded jacket) approximately 690 to 1379 kPa *(100-200 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)*

5. OUTER JACKET ON PIPE INSULATION

The outer protective jacket shall consist of either:

i.) Extruded system*:* (available from Calmar, AB only)
   a) Jacket 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/cm^3 (>59.1 to 59.6 lbs/ft^3) 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.

ii.) PE cased system*:* (available from both manufacturing facilities)
   a) Jacket material: Casing extruded from polyethylene resin with cell class requirements 334360C as defined in ASTM D3350-12.

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b) Polyethylene compound shall be of color and UV stabilizer Code C (black) as specified in ASTM D3350, with a target range of 2 to 2.5% well dispersed carbon black (max. 2.8%);
c) Jacket thickness shall be 3.81 mm (*150 mils*) to 7.62 mm (*300 mils*) depending on pipe diameter and PE casing availability from supplier.

Recommended PE Jacket thicknesses* for above grade applications-

Jacket OD ≤ 300 mm (*12 in*)	@ 3.17 mm (*125 mils)*
Jacket OD > 300 mm (*12 in*) to 600 mm (*24 in*)	@ 3.81 mm (*150 mils*)
Jacket OD > 600 mm (*24 in*)	@ 4.44 mm (*175 mils*)

*other jacket thicknesses are available upon request

6. INSULATED PIPE JOINTS

Insulated pipe joints shall be completed with Slipjoint® kits consisting of preformed polyisocyanurate foam or polyurethane foam half shells supplied with PE cover sheet, stainless steel bands, gear clamps and self tapping screws. All PE overlaps at the joints and fittings shall be 50.8 mm *(2 in)* minimum and shall be field positioned in such a way as to shed water. A heat shrink sleeve as supplied by GF Urecon shall be field applied to the insulation half shells as primary seal under the PE cover sheet.
For more demanding waterproof application, GF Urecon Mec-Seal® joint kits should be considered in place of Slipjoint® kits with primary seal.

7. INSULATION FOR FITTINGS

7.1 Field applied insulation

Insulation for fittings shall consist of rigid polyisocyanurate or polyurethane foam half shells complete with a heavy polymer protective coating on the outside surfaces. All insulation kits shall be supplied complete with silicone caulking, stainless steel bands and gear clamps. If the insulation shells are form hugging to the fitting, 152.4 mm *(6 in)* wide PE cover sheets & heat shrink sleeve as primary seal with stainless steel bands and gear clamps shall be supplied for each end of the kit.

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: typically 50 mm (2 in), other thicknesses upon request, shall match pipe insulation thickness.

b) Polymer coating, GF Urecon BL-100-20EP

1. Two component high density polyurethane coating, black in color.
2. Density: 1170 kg/m³ *(73 lbs/ft³).*
3. Durometer D scale 60.
4. Tensile strength: 11.10 MPa *(1610 lbs/in²).*
5. Tear strength: 26.5 N/mm *(151 lbs/in).*
6. Thickness: 2.54 mm *(100 mils)* outside surfaces, 0.51 mm *(20 mils)* inside surfaces.

7.2 Factory insulated fittings

GF Urecon recommends that fittings be factory insulated and fitted with extension legs. Outer jacket shall be as per section 5 above and be mitered / fused around the fitting to form a robust waterproof assembly. The annular space shall then be filled with polyurethane insulation as per Section 3 above.
Expansion/contraction pads shall be installed as per specifications; consult GF Urecon for design assistance if required.

7.3 End seals

Canusa PLX-65 heat shrinkable end seals shall be field installed at all pipe insulation exposed ends at thrust blocks, building entries, etc.

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

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