Design Standard

High Density Polyethylene (HDPE) Piping Installations

Texas A&M University requires the use of Extra High Molecular Weight Plus (EHMW Plus) High Density Polyethylene (HDPE) pipe due to its additional performance against abrasion, higher pressure and elevated temperatures. This pipe is manufactured with the PE4710 resin.

For chilled water and domestic cold water a minimum of SDR 17 is required. For heating water and domestic hot water a minimum of SDR 11 is required. For sanitary sewer a minimum of SDR 26 is required (SDR 17 is recommended under mall and paver areas).

For heating water, all pipe shall be "DOW 2499 Water" per the specification in Appendix A (attached).

The following standards and practices shall be adhered to:
Polyethylene fabricated fittings shall be manufactured from polyethylene pipe, sheet stock or molded fittings meeting the material requirements of this specification and all appropriate requirements of AWWA C-901 or AWWA C-906.

Polyethylene fittings, including custom fabrications, shall have the same internal pressure rating as the mating pipe. At the point of fusion, the wall thickness and outside diameter of the fitting shall be in accordance with AWWA C-901 or AWWA C-906 for the same pipe size.

Thermal lines shall be insulated in accordance with the Underground Piping Systems Design Standard.

Detailed specifications follow.

PART 1 JOINING

1.1 Heat Fusion

A. Pipe and fittings shall be joined by one of the following types of thermal fusion per the Manufacturer’s recommended procedures: Butt fusion, Saddle fusion or Socket fusion.

B. Upon request, the Manufacturer shall provide fusion training by authorized personnel or an authorized Representative. The Contractor shall be responsible for ensuring that personnel have received proper training per the Manufacturer’s recommended procedure. Records of training shall be maintained by the Contractor and should not exceed 12 months from date of construction.

C. Butt fusions performed between pipe ends or pipe ends and fitting outlets shall be within the following allowable wall mismatches:

1. 2 DR difference for pipe and fitting diameters 6”IPS and smaller.
2. 1 DR difference for above 6" through 18".

3. No difference for diameters above 18".

The difference in DR's is determined from the following DR values: 7.3, 9, 11, 13.5, 17, 21, 26 and 32.5

1.2 Other Methods of Joining

A. Polyethylene pipe and fittings may be joined together or to other materials through the use of electrofusion fittings, flange adapters with back-up rings, mechanical couplings designed for connecting polyethylene pipe and fittings to itself or to another material, or MJ adapters. The Manufacturer of the joining device shall be consulted for proper installation procedures.

PART 2 MARKING

2.1 Pipe and tubing shall be permanently marked in accordance with all applicable standards per this specification. Marking shall be heat stamped indent print and shall remain legible under normal handling and installation practices.

2.2 Fittings shall be marked on the body or hub. Marking shall be in accordance with the applicable standard depending upon the fitting type. Mechanical fittings shall be marked with size, body material designation code, pressure rating and the Manufacturer's name or trademark.

PART 3 WORKMANSHIP

3.1 Pipe, tubing and fittings shall be homogenous throughout, and free of visible cracks, holes, foreign inclusions, blisters, dents or other injurious defects. The pipe, tubing and fittings shall be as uniform as commercially practicable in color, opacity, density and other physical properties.

PART 4 TESTING

4.1 The Contractor shall be responsible for field set-up and performance of the fusion equipment and the fusion procedure used by the operator. Upon request, the Contractor shall verify the fusion quality by making and testing per the Manufacturer's recommended qualification procedure. The Contractor shall be responsible for the necessary adjustments to the set-up, equipment, operation and fusion procedure. Fusions that fail the qualification procedure shall be remade.

4.2 Hydrostatic testing shall be conducted in accordance with the Manufacturer's recommended testing procedures.
4.3 Low pressure pneumatic testing may be conducted on gravity sewer lines in accordance with ASTM F1417. Other methods of pneumatic testing are not recommended.

PART 5 THIRD PARTY CERTIFICATION

5.1 The performance requirements of the pipe and fittings shall comply with the most current version of AWWA C-901 or AWWA C-906. The Manufacturer shall be listed with NSF-61 certification and include the third party certification within the print line of the product.
APPENDIX A

INTREPID 2499 NT TECHNICAL INFORMATION
INTREPID™ 2499 NT
Bimodal Polyethylene Resin

Overview
INTREPID™ 2499 NT Bimodal Polyethylene Resin is a Polyethylene resin produced using UNIPOL II process technology. This product is intended for use in industrial piping systems where extreme conditions such as high temperatures, aggressive chemicals, hydrocarbons, or highly oxidative conditions exist. Suitable uses include oil and gas field pipelines, gas distribution pipelines, and other industrial applications.

Industrial Standards Compliance:
ASTM D 3350: cell classification PE445574A
Plastics Pipe Institute (PPI); TR-4
- Natural Pipe INTREPID™ 2499 NT Bimodal Polyethylene Resin
  - ASTM PE4710 pipe grade - 1600psi HDB @ 73 °F (23°C)
  - ASTM PE4710 pipe grade - 800psi HDB @ 180 °F (82.2°C)

Additive
- Anti Block: No
- Slip: No
- Processing Aid: Yes

<table>
<thead>
<tr>
<th>Physical</th>
<th>Nominal Value (English)</th>
<th>Nominal Value (SI)</th>
<th>Test Method</th>
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<tbody>
<tr>
<td>Density (Natural)</td>
<td>0.950 g/cm³</td>
<td>0.950 g/cm³</td>
<td>ASTM D792</td>
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<tr>
<td>Melt Mass-Flow Rate</td>
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<tr>
<td>190°C/2.16 kg</td>
<td>0.10 g/10 min</td>
<td>0.10 g/10 min</td>
<td>ASTM D1238</td>
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<tr>
<td>190°C/21.6 kg</td>
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<td>Tensile Strength (Yield)</td>
<td>&gt; 3500 psi</td>
<td>&gt; 24.1 MPa</td>
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<td>Tensile Elongation (Break)</td>
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<td>&gt; 500 %</td>
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<td>Flexural Modulus</td>
<td>152000 psi</td>
<td>1050 MPa</td>
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<td>Resistance to Rapid Crack Propagation, Pcr - S-4</td>
<td>&gt; 174 psi</td>
<td>&gt; 12.0 bar</td>
<td>ISO 13477³</td>
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<td>Resistance to Rapid Crack Propagation, Tcr - S-4 @ 145 psi (10 bar)</td>
<td>&lt; 2 °F</td>
<td>&lt; -17 °C</td>
<td>ISO 13477³</td>
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<td>Slow Crack Growth @ 2.4 MPa</td>
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<td>ASTM F1473¹</td>
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<td>176°F (80°C)</td>
<td>&gt; 10000 hr</td>
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<td>194°F (90°C)</td>
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<td>Notched Izod Impact (73°F (23°C))</td>
<td>9.1 ft-lb/in</td>
<td>490 J/m</td>
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<td>Britteness Temperature</td>
<td>&lt; -103 °F</td>
<td>&lt; -75.0 °C</td>
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<td>Melting Temperature (DSC)</td>
<td>259 °F</td>
<td>132 °C</td>
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<td>Thermal Stability</td>
<td>&gt; 428 °F</td>
<td>&gt; 220 °C</td>
<td>ASTM D3350</td>
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Extrusion Notes
Fabrication Conditions:
- Screw Type: High quality HDPE barrier with mixing
- Melt Temperature Range: 380-450°F (193-232°C)

Notes
These are typical properties only and are not to be construed as specifications. Users should confirm results by their own tests.

¹ Compression molded parts prepared according to ASTM D 1928 Procedure C. Properties will vary with changes in molding conditions and aging time.

² Method I (3 point load)

³ Pipe diameter of 10 inch IPS (25.4 cm) and Standard Diameter Ratio (SDR) 11.
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