Ultrafoam FBE consists of a Fusion Bond Epoxy corrosion barrier, spray applied polyurethane foam overcoated with an adhesive or bonding film followed by a durable high density polyethylene jacket. This polyurethane foam insulation system is designed to provide excellent thermal insulation and corrosion protection characteristics. Customers may choose from a variety of FBE coatings depending on the maximum pipeline operating temperature.

**Product Features**
- Designed for operating temperatures from -40°C up to 120°C
- Polyurethane foam can be applied at thicknesses from 25.4mm (1 inch) to 76.2mm (3 inches)
- Field bendable to CSA Z662 Specifications with proper bending equipment and procedures.
- Designed to provide excellent thermal insulation and corrosion protection for higher temperature buried pipelines.

**Cold Weather Handling**: Precautionary measure must be exercised during handling and installation in cold temperatures (-30°C and colder). Please contact Perma-Pipe Canada for more information on cold weather handling recommendations and procedures.

**Pipe Application Range**
- Minimum pipe diameter: 88.9mm (3.5 inches)
- Maximum Pipe Diameter: 1067mm (42 inches)
- Minimum Pipe Length: 5.5m (18 feet)
- Maximum Pipe Length: 25m (82 feet)

**Compliance**
- FBE: CSA Z245.20 1A, 1B or 2A as specified
- Polyurethane Insulation: CSA Z245.22
## Typical Properties and Performance Characteristics

### Corrosion Barrier Properties per CSA Z245.20 System 1A

<table>
<thead>
<tr>
<th>Property</th>
<th>Conditions</th>
<th>Requirements</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesion</td>
<td>24 hours @ 75°C</td>
<td>Rating 1 - 3</td>
<td>Rating 1 - 2</td>
</tr>
<tr>
<td>Cathodic disbondment</td>
<td>28 days @ 20°C @ 1.5V</td>
<td>≤ 8.5mm</td>
<td>4.0mm</td>
</tr>
<tr>
<td>Cathodic disbondment</td>
<td>24 hours @ 65°C @ 3.5V</td>
<td>≤ 11.5mm</td>
<td>3.0mm</td>
</tr>
<tr>
<td>Porosity</td>
<td>24 hours @ 65°C @ 3.5V</td>
<td>Rating 1 - 4</td>
<td>Rating 1 - 2</td>
</tr>
<tr>
<td>Flexibility (85°C system)</td>
<td>2.5 degrees @ -30°C</td>
<td>No cracking</td>
<td>No cracking</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>-30°C</td>
<td>≥ 1.5 J</td>
<td>No holidays @ 1.5 J</td>
</tr>
</tbody>
</table>

### Polyurethane Foam Properties

- **Density** ASTM D1622: > 40 kg/m³
- **Compressive strength** ASTM D1621: ≥ 0.3 MPa
- **Open cell content** ASTM D6226: ≤ 12%
- **Thermal conductivity** ASTM C518: ≤ 0.03 W/mK

### External Jacket Properties

- **PE density** ASTM D1505: > 0.940 g/cm³
- **Elongation** ASTM D638: 600%
- **Tensile strength** ASTM D638: 18.5 MPa
- **Impact resistance** ISO 179-1: ≥ 3.0 kJ/m²
- **Outdoor exposure**: ≤ 2 years

### Dimensional Properties

#### Coating

- **FBE thickness for 105°C**: 508 micrometers (20 mils) min, 559 micrometers (22 mils) nom
- **Foam thickness** (Customer specified): 25.4mm (1 inch) to 76.2mm (3 inches) (-3/+10mm)
- **Adhesive or bonding film over foam and/or tape**: Complete coverage
- **External polyethylene jacket** (higher thickness available on request):
  - ≤ NPS 12: ≥ 1.0mm
  - > NPS 12 ≤ 20: ≥ 1.5mm
  - > NPS 20: ≥ 2.0mm

### Operating Properties

- **Maximum operating temperature**: 85°C to 120°C depending on FBE coating
- **Minimum operating temperature**: -40°C

*Please see notes on cold weather handling on front of data sheet.*

**Girth Weld Protection**: Perma-Pipe Canada can supply heat shrinkable sleeves and polyurethane foam half shells for completion of insulation system on field joint areas.

**Note**: For contractual purposes, the most recent edition of Perma-Pipe’s Quality Plan shall apply, written agreements between the Customer and Perma-Pipe Canada.