FOAMGLAS® insulation is a lightweight, rigid material composed of millions of completely sealed glass cells. Each cell is an insulating space. FOAMGLAS® insulation is all glass ... completely inorganic ... no binder, no fillers.

FOAMGLAS® insulation is an impermeable, noncombustible, cellular glass insulation that provides long life, easy installation and low maintenance in piping, vessel and equipment applications.

FOAMGLAS® insulation is successfully performing in virtually every major process industry.

FOAMGLAS® insulation is manufactured in block form, then cut, tapered or shaped as required. All products are available through, and may be fabricated by, Pittsburgh Corning authorized Industrial Distributors. It is also very simple to reshape FOAMGLAS® insulation on the job site. No special tools are required.

In addition, Pittsburgh Corning offers a full line of complementary accessory products, each laboratory- and service-proven to provide maximum performance specifically with FOAMGLAS® cellular glass insulation.

All-glass FOAMGLAS® insulation has a closed cell structure which gives it high resistance to moisture in liquid or vapor form.

FOAMGLAS® insulation is easy to cut and shape with normal hand tools.

FOAMGLAS® Insulation Certifications*
- ASTM C 552-00, “Specification for Cellular Glass Block and Pipe Thermal Insulation”
- Canadian Government Specifications Board, 51-GP-38
- Nuclear Regulatory Guide 1.36
- ISO 9002 Certification

Approval
FOAMGLAS® insulation is approved for use according to:
- General Services Administration, PBS (PCD): Public Building Service 15250, Guide Specification, “Thermal Insulation (Mechanical)”

* Written request for certificate of compliance must accompany order.
THE IDEAL UNDERGROUND INSULATION SYSTEM

The ideal insulation system must be capable of meeting the mechanical and corrosion resistance requirements of direct burial while providing long-term insulation efficiency. Ignoring these basic considerations may result in problems.

The direct burial of insulated pipelines is often the most practical method of installing underground piping systems. This method eliminates the need for costly tunnels and speeds the installation of the piping system.

The FOAMGLAS® Insulation System consists of FOAMGLAS® cellular glass insulation and flexible PITTWRAP® jacketing. It is the ideal system for direct burial underground.

FOAMGLAS® insulation is:
• Highly resistant to soil moisture in liquid or vapor form
• Unaffected by soil acids
• Chemically inert
• Strong enough for direct burial with no protective tunnels needed

On hot, buried systems located in a high water table area, improperly sealed systems may allow moisture entry into the system. High temperature water or steam in long-term contact with FOAMGLAS® insulation will result in chemical attack with a gradual penetration of the insulation cells.

The success of a direct burial system will depend to a great extent upon the system chosen, proper design and proper installation. Some of the key considerations which should be addressed by the design professionals prior to selecting a particular insulation system are:
• Type of system: chilled water, hot water, steam or other
• Operating temperatures of all pipes, constant or cycling
• Pipe length, diameter, spacing, burial depth, number and nature of runouts
• Soil type, bearing strength, electrical potential
• Location of water table

TABLE 1: Physical and Thermal Properties of FOAMGLAS® Insulation

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>USA</th>
<th>METRIC</th>
<th>SI</th>
<th>ASTM TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption of Moisture (% by volume)</td>
<td>0.2%</td>
<td></td>
<td></td>
<td>C 240</td>
</tr>
<tr>
<td>Water-Vapor Permeability</td>
<td>0.0 perm-in</td>
<td>0.0 perm-in</td>
<td></td>
<td>E 96†</td>
</tr>
<tr>
<td>Acid Resistance</td>
<td>Impervious to common acids and their fumes except hydrofluoric acid.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capillarity</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Compressibility</td>
<td>Noncombustible, will not burn.</td>
<td></td>
<td></td>
<td>E 136</td>
</tr>
<tr>
<td>Composition</td>
<td>Pure glass, totally inorganic, contains no binder.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressive strength for standard material (7%-10%)</td>
<td>90 psi</td>
<td>6.3 kg/cm²</td>
<td>620 kPa</td>
<td>C 165, C 240, C 552-00</td>
</tr>
<tr>
<td>Density, Average</td>
<td>7.5 lb/ft³</td>
<td>120 kg/m³</td>
<td>120 kg/m³</td>
<td>C 303</td>
</tr>
<tr>
<td>Dimensional Stability</td>
<td>Excellent—does not shrink, swell or warp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexural Strength, Block Average</td>
<td>70 psi</td>
<td>4.9 kg/cm²</td>
<td>480 kPa</td>
<td>C 203, C 240</td>
</tr>
<tr>
<td>Hygroscopicity</td>
<td>No increase in weight at 90% relative humidity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear Coefficient of Thermal Expansion (25° to 300°C)</td>
<td>5.0 X 10⁻⁶/°F</td>
<td>9.0 X 10⁻⁶/°C</td>
<td>9.0 X 10⁻⁶/°K</td>
<td>E 228</td>
</tr>
<tr>
<td>Maximum Service Temperature</td>
<td>+900°F</td>
<td>+482°C</td>
<td>755°K</td>
<td></td>
</tr>
<tr>
<td>Modulus of Elasticity, Approx.</td>
<td>1.3 X 10⁶ psi</td>
<td>9.300 kg/cm²</td>
<td>900 MPa</td>
<td>C 623</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>No reliable recognized test method for determination of the shear strength for cellular glass exists at this time. Where shear strength is a design criterion, PCC should be contacted for recommendations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>Btu-in/hr-ft²-°F</td>
<td>kcal/m²·°C</td>
<td>W/mK</td>
<td>C 177, C 518</td>
</tr>
<tr>
<td>Specific Heat</td>
<td>0.20 Btu/lb°F</td>
<td>0.20 kcal/kg°C</td>
<td>0.84 kJ/kg°K</td>
<td></td>
</tr>
<tr>
<td>Thermal Diffusivity</td>
<td>0.016 ft²/hr</td>
<td>0.0042 cm²/sec</td>
<td>4.2 x 10⁻⁷ m²/sec</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Properties at 75°F unless otherwise specified. Properties may vary with temperature. These values are average or typical values recommended for design purposes, and are not intended as specification or limit values.

FOAMGLAS® Insulation’s excellent compressive strength permits direct underground burial.
SECTION 2  DIRECT BURIAL INSULATION SYSTEM

Top left: PITTWRAP® jacketing protects FOAMGLAS® insulation on 180°F piping system. System will subsequently be buried.

Bottom left and right: A composite insulation system—two layers of FOAMGLAS® cellular glass insulation encasing a layer of fiybrus glass insulation—helps maintain required steam temperature and pressure in this high-temperature underground line. (Insulation is shown prior to application of jacketing.)
The insulation system consists of FOAMGLAS® cellular glass insulation and flexible PITTWRAP® jacketing.

FOAMGLAS® insulation is impermeable to moisture, unaffected by soil acids, chemically inert and strong enough for direct burial with no protective tunnels needed.

PITTWRAP® jacketing provides a waterproof membrane against most soil and water conditions, and has the resiliency to perform in direct burial applications.

FOAMGLAS® insulation systems do not require cathodic protection.

**Jacketing**

PITTWRAP® jacketing is a 125 mil (3.2 mm) thick heat-sealable, multi-ply laminate for protecting underground FOAMGLAS® systems with outer surface temperatures below 190°F (87.7°C).

PITTWRAP® jacketing consists of three layers of a polymer-modified, bituminous compound separated by glass reinforcement and aluminum foil. An outer layer of polyester film is laminated to the bituminous compound. Release paper prevents sticking in the roll before use. PITTWRAP® jacketing may also be factory-applied on the insulation.

**PITTWRAP® SS** jacketing is a 70 mil (1.8 mm) thick self-sealing, modified bituminous membrane for protecting underground FOAMGLAS® insulation systems with outer surface temperatures below 170°F (76.7°C). Manual pressure seals the jacketing without the use of a torch or heater. PITTWRAP® SS jacketing may also be factory-applied on the insulation.

**PITTWRAP® CW Plus** jacketing consists of a polymer-modified, bituminous compound reinforced with a woven glass fabric and a 1 mil (0.03 mm) aluminum top film and release paper backing.

**PITTWRAP® CW Plus** jacketing is a 50 mil (1.3 mm) thick self-sealing, modified bituminous membrane for protecting underground FOAMGLAS® insulation systems on chilled water and hot service pipelines. Manual pressure seals the jacketing without the use of a torch or heater. PITTWRAP® CW Plus jacketing may also be factory-applied on the insulation.

**TABLE 2: Physical Properties of PITTWRAP® Jacketing**

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>PITTWRAP® Jacketing</th>
<th>PITTWRAP® SS Jacketing</th>
<th>PITTWRAP® CW Plus Jacketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (mils)</td>
<td>125</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>Tensile Strength, 20°F</td>
<td>165</td>
<td>120</td>
<td>–</td>
</tr>
<tr>
<td>(lb/in width)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength, 78°F</td>
<td>105</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>(lb/in width)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (lb/100 sq ft)</td>
<td>66</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>Jacketing Temperature Limits (°F)</td>
<td>20 to 190</td>
<td>0 to 170</td>
<td>-25 to 100</td>
</tr>
<tr>
<td>Application Temperature, Minimum (°F)</td>
<td>20</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Without primer</td>
<td>N/A</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>With primer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance to Soil Acids</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Permeability (ASTM E 96)</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>(perm-inch)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This specification has been prepared by Pittsburgh Corning Corporation using generally accepted and appropriate technical information, but it is not intended to be solely relied upon for specific design or technical applications. Having no control over the elements of design, installation, workmanship or site conditions, Pittsburgh Corning assumes that the actual design choices and installation will be made by persons trained and qualified in the appropriate disciplines. Therefore, Pittsburgh Corning disclaims all liability potentially arising from the use or misuse of this specification.

**Design Precautions**

There are situations which require special design consideration. Contact Pittsburgh Corning for proper procedures to accommodate these situations:

- Direct exposure to:
  - A. Hydrofluoric acid or strong caustics.
  - B. Water during freeze-thaw cycling.
  - C. Condensing steam and water vapor at temperatures or above 140°F.
  - D. Hot phosphoric acid.

---

**Part 1—General**

Applications subject to continuous submersion in water may require a different specification. Provision for thermal expansion must be made in the form of loops, elbows, zees or special design consideration. Contact Pittsburgh Corning for proper procedures to accommodate these situations:


- 2.2 Insulation

- 2.3 Asphalt Coating

- 2.4 Reinforcing Fabric

- 2.5 Strapping Tape

- 2.6 Bore Coating

- 2.7 High-Temperature Sealant

---

**Part 3—Execution**

### 3.1 Preparation

After the nominal system diameter has been prejacketed with FOAMGLAS® insulation which has been prejacketed with standing water during insulation and jacketing application.

**Note:** Where excessive or cyclical movement is anticipated, the bore of FOAMGLAS® insulation shall be coated with a thin application of bore coating and allowed to dry before insulation is applied to the pipe.

#### 3.2 Insulation Application

**FOAMGLAS®** insulation and **PITTWRAP®** jacketing shall be applied to piping in 10’ segments (maximum length). After completion, the segments are rotated 180° and the bottom of the jacketing and butt strips are inspected for proper application and sealing. If any defects are visible, they must be corrected. Major defects may require removal of jacketing. Assuming proper jacketing and sealing, the segments are rotated back into position and the connecting butt strips are applied.

- A. Field jacketed insulation—staggered joints: the last section of FOAMGLAS® pipe covering the 10’ segment is cut even to form a through joint between completed segments.

- B. Large diameter piping: shorter segments can be insulated and jacketed if more practical.

- C. Abrasion: Insulation sections for large diameter piping will have to be bore coated.

- D. Special considerations—anchors, guides, expansion loops, elbows, etc.: the completed insulated segment is rotated and inspected before installing the connecting section of insulation at the anchors, guides, expansion loops, elbows, etc. These procedures are not to be used on oversized insulation.

#### 3.2.1 Field-Jacketed

Field-jacketed FOAMGLAS® insulation shall be applied to the piping with butt joints staggered and tightly butted. Longitudinal and butt joints shall be left dry. All joints shall be tightly fitted to eliminate voids by refilling or replacing sections of insulation. Each section of insulation shall be held in place by two wraps of strapping tape with a 50% overlap per wrap. For double-layer applications, the second layer of FOAMGLAS® insulation shall be applied in a manner similar to the first, with all joints staggered between layers.

#### 3.2.2 Factory-Jacketed

FOAMGLAS® insulation which has been prejacketed with
PITTWRAP® jacketing shall be applied joint-to-joint with all joints tightly butted. Strapping tape may be used over the jacketing to temporarily secure the insulation until longitudinal laps are sealed and butt strips applied. See Section 3.3 and appropriate data sheet for details for sealing PITTWRAP® jacketing laps and butt strip application.

### 3.2.3 Pre-Insulation of Pipe
Where conditions permit, FOAMGLAS® insulation and jacketing may be applied outside of the trench to sections of piping. Pipe lengths should be insulated in segments. Length of insulation segment should not exceed 10’ (3 m). Leave uninsulated spaces between segments to allow for placement of slings by which the pipe can be lowered into the trench. The use of a spreader bar with two slings or more is recommended. The quantity and location of sling placement shall be determined by the design professional to avoid excessive deflection and facilitate proper control of the pipe length during transfer. After the sections of pipe are in place in the trench, and ends of the sections secured, insulation and jacketing shall be applied to the joint areas and uninsulated spaces that were not completed above ground. Adequate working space should be maintained for installation personnel.

### 3.3 Jacketing Application
Apply the specified jacketing in strict accordance with the appropriate product data sheet. Request Technical Data Letter L244 for quality control installation methods. Seal all overlaps and butt strips as noted in the product data sheet to ensure that ground water cannot penetrate the jacket system.

**Note:** In tunnels, manholes and pre-cast trenches where high ambient temperatures may exist, metal bands should be installed 12” on center of the jacketing exterior to control slippage of the overlap seal.

### 3.3.1 Irregular Surfaces
At all irregular surfaces such as elbows, tees, fitting covers, etc., the PITTWRAP® jacketing shall be precut to fit the contour of the surface to which it is to be applied. Precut sections shall allow for 2” (5 cm) overlap. All laps shall be sealed.

In addition to sealing the PITTWRAP® jacketing on these irregular surfaces, a glove coat of the PITTCOTE® 300 coating shall be applied over the jacketing. First, carefully burn away the exterior plastic film on the PITTWRAP® jacketing. Then apply a glove coat of PITTCOTE® 300 coating. While still tacky, embed a layer of reinforcing fabric in the coating. After one hour, apply a second coat of PITTCOTE® 300 coating over the first coat. Total wet film thickness of the two coats should be 1/8” (3 mm) minimum.

As an alternative to the cutting and fitting of PITTWRAP® jacketing on fittings, a five-layer application of PITTCOTE® 300 coating may be used. The coating shall be applied in accordance with the procedures found in product data sheet Fl-120, in alternating layers of mastic, reinforcing fabric, mastic, mastic fabric and mastic, totaling five layers. Total wet film thickness shall be 1/4” (6 mm) minimum.

If backfilling takes place less than 24 hours after PITTCOTE® 300 coating is applied, roof felt shall be placed over the coating before backfilling.

**Ends and bore of insulation left exposed at day’s end shall be sealed between the insulation and the pipe with PITTCOTE® 300 coating to prevent bulk water entry.**

All completed work shall be backfilled as soon as possible to prevent damage to the insulation system.

### 3.4 Special Consideration
#### 3.4.1 Anchors/Guides
Size of concrete anchors and guide blocks and locations of each shall be determined by the engineer or design professional. Anchors shall be continuously welded to the carrier pipe. When sizing anchors, coefficient of friction for FOAMGLAS® insulation is an average of 0.6.

It is common engineering practice to locate guide lines on both sides of an expansion loop, zee or expansion joint. The line guide ensures that the thermal expansion is properly directed into the expansion mechanism.

Butt ends of insulation in contact with anchor and/or guide plates shall be sealed continuously to plates with high-temperature sealant.

Diameter of pipe sleeve guides shall be a maximum of 1/4” (6 mm) greater in diameter than the diameter of the pipe.

#### 3.4.2 Wall Penetrations
The penetrations should be designed so that no movement occurs at the penetrations except for manholes containing expansion couplings. All other movement should be accommodated by expansion loops or at changes of direction.

Prime all concrete surfaces at penetrations before applying asphalt coating.

### 3.4.3 Expansion Provisions
Expansion loops, ells, zees and lead-off lines shall be insulated with oversize insulation. Inside diameter of the oversize insulation shall be the same as the exterior diameter of the straight run piping insulation. If the calculated pipe movement is greater than this allowance, contact Pittsburgh Corning Corporation. Oversize insulation shall be used to accommodate expansion laps and provide for expansion joint. The line guide ensures that the thermal expansion is properly directed into the expansion mechanism.

**Concrete pad supports molded to fit inside the oversized insulation to center the pipe and to allow free movement shall be provided. Concrete supports may be fabricated in the field or prefabricated. These supports should be cured a minimum of seven days prior to use in steam piping applications.**

Alternatively, expansion joints may be used to accommodate expansion and are to be insulated. Expansion joints are common on pipes larger than 12” (30 cm) NPS. A sheet metal insulation support shall be provided to support the oversize insulation. If pipe insulation is not of sufficient thickness to allow sheet metal support to clear expansion joints, provide insulation collars of sufficient thickness and minimum 9” (23 cm) width to provide clearance.

Spacing and design of guides, anchors and expansion provi- sions are the responsibility of the engineer or design professional.

### 3.5 Field Quality Control
After application of the jacketing system to all straight and irregular sections of insulation, visually inspect all laps, seams, butt strips and glove-coated areas to ensure that these areas are sealed from water entry in accordance with the specifications and appropriate product data sheets.

### 3.6 Backfilling
The trench shall be carefully backfilled using the excavated earth approved for backfilling, consisting of sand, clay, earth, loam or other approved materials. Backfill shall be placed within 6” (15 cm) of the insulated pipe and shall be free of rocks, debris or stones greater than 1/4” (6 mm) diameter. There shall be a minimum 9” (23 cm) width to provide clearance.

**Concrete pad supports molded to fit inside the oversized insulation to center the pipe and to allow free movement shall be provided. Concrete supports may be fabricated in the field or prefabricated. These supports should be cured a minimum of seven days prior to use in steam piping applications.**

Alternatively, expansion joints may be used to accommodate expansion and are to be insulated. Expansion joints are common on pipes larger than 12” (30 cm) NPS. A sheet metal insulation support shall be provided to support the oversize insulation. If pipe insulation is not of sufficient thickness to allow sheet metal support to clear expansion joints, provide insulation collars of sufficient thickness and minimum 9” (23 cm) width to provide clearance.

Spacing and design of guides, anchors and expansion provi- sions are the responsibility of the engineer or design professional.
Insulation Thickness Recommendations
A detailed thermal analysis report giving thickness recommendations for single or multiple pipes, steady or transient conditions, and summer or winter environment can be provided by Pittsburgh Corning’s Energy Analysis section. Contact any sales office or the Corporate Headquarters shown on the back cover.

* Size and location of anchors or guides and concrete block to be determined by design engineer.
FIGURE 6: Wall Penetration

FIGURE 6A: Wall Penetration (Alternate Method)

FIGURE 7: Mechanical Expansion Contraction Device in Manholes

Notes: 1. Insulation may be left unjacketed in manholes to allow servicing of coupling.
2. Provide drainage for all manholes.
FIGURE 8: Expansion Zee

Notes:
1. Concrete chamber cover to provide minimum 3" cover top and sides. See Figure 8-8A (Section A-A).
2. Install line guides on both ends of loop/zee for proper pipe alignment. Typically these guides are located close to the bends.

FIGURE 8A: Expansion Loop

Notes:
1. Concrete chamber cover to provide minimum 3" cover top and sides. See Figure 8-8A (Section A-A).
2. Install line guides on both ends of loop/zee for proper pipe alignment. Typically these guides are located close to the bends.
FIGURE 8-8A: Expansion Chamber Detail (Section A-A)

Concrete Chamber Cover
Top and Sides

3" Min.

2" Min. Insulation Thickness

Oversized FOAMGLAS®
Insulation with
PITTWRAP® Jacketing

3" Min.

Concrete Support Pad
(See Table 3)

Sand Bed

FIGURE 9: Oversized Insulation Pipe Support Detail

Pipe

Concrete Support Pad (See Table 3)

PITTWRAP®
Jacketing

Oversized FOAMGLAS® Insulation

FOAMGLAS® Insulation Concrete Form

TABLE 3: Suggested Size and Spacing of Expansion Chamber Concrete Support Pads

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Length of Pad (Dim. “A”)</th>
<th>Max. O.C. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 3” NPS</td>
<td>6”</td>
<td>8'-0”</td>
</tr>
<tr>
<td>4” NPS</td>
<td>6”</td>
<td>8'-0”</td>
</tr>
<tr>
<td>5” NPS</td>
<td>12”</td>
<td>8'-0”</td>
</tr>
<tr>
<td>6” NPS</td>
<td>12”</td>
<td>6'-0”</td>
</tr>
<tr>
<td>8” NPS</td>
<td>12”</td>
<td>4'-0”</td>
</tr>
<tr>
<td>10” NPS</td>
<td>12”</td>
<td>3'-0”</td>
</tr>
<tr>
<td>12” NPS and Over</td>
<td>Continuous</td>
<td></td>
</tr>
</tbody>
</table>

Based on standard pipe filled with water.
Minimum of two pads required at 90° turns.
FOR COMPLETE DATA ON FOAMGLAS® INSULATION SYSTEMS, CONTACT PITTSBURGH CORNING’S MARKETING DEPARTMENT

CORPORATE HEADQUARTERS
800 Presque Isle Drive
Pittsburgh, PA 15239-2799
724-327-6100
800-359-8433
Fax: 724-325-9704

INTERNATIONAL
Pittsburgh Corning International Sales Corporation
724-327-6100
Fax: 724-733-4815

CANADA
Edmonton, Alberta
780-424-2640
Montreal, Quebec
514-866-9100

Visit Pittsburgh Corning Corporation’s FOAMGLAS® Insulation Website at www.foamglasinsulation.com.

ADDITIONAL BROCHURES AVAILABLE FOR PITTSBURGH CORNING CORPORATION FOAMGLAS® PRODUCTS:

- FOAMGLAS® Insulation Systems (FI-201)
- AdVantage® System (FI-227)
- Chilled Water Brochure (FI-188)
- Roofing/Plazas/Parking Decks (FB-180)

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