

**HITHERM® INSULATION SPECIFICATION**  
HITHERM® Technical Support

**SPECIFICATION FOR THE APPLICATION OF HITHERM® PIR300 25/50 INSULATION  
TO ABOVE GROUND COLD PIPING FROM (+35°F to +70°F)**

**1. SCOPE**

- 1.1. This guideline encompasses the installation of HiTHERM PIR300 25/50 rigid polyisocyanurate insulation on chilled water piping systems in commercial and industrial applications, including use in air plenums.
- 1.2. Product Data sheets, specifications and other HiTHERM information are referenced in this guideline, please visit <http://www.hitherm.com> for current versions of these documents.
- 1.3. The procedures and information provided in this guideline is current as of January 2010. This document is subject to revision without notice. Contact HiTHERM at (205) 961-0009 or your local representative for up-to-date information.
- 1.4. Due to the variety of ambient and operating conditions, this guideline may not be applicable in every situation. Design or specifying engineers may have more detailed knowledge of the owner's needs and can tailor a more precise specification for each application.
- 1.5. This guideline is tailored for the installation of HiTHERM's PIR Series insulations and should not be used for installation of another manufacturer's products. Please consult the proper manufacturers for recommended installation and application procedures.

**2. GENERAL**

- 2.1. This guideline is offered as a reference for the purpose described herein and should be utilized at the discretion of the user. No warranty of procedures, either expressed or implied, is intended.
- 2.2. All piping and equipment to be insulated shall be cleaned of oil, grease, rust and foreign matter, and shall be dry and free of frost, prior to and during insulation application.
- 2.3. All insulation materials shall be delivered to the project site in unbroken factory packaging labeled with product designation and thickness and stored in a dry area protected from the weather before and during application.
- 2.4. All testing of the system shall be accomplished prior to application of insulation.
  - 2.4.1. Inspection of the application of insulation is the responsibility of the owner and/or his representative. HiTHERM® does not incur responsibility for workmanship.

**3. MATERIALS**

**3.1. Insulation Materials**

- 3.1.1. Insulation shall be HITHERM PIR300 25/50 closed cellular polyisocyanurate (PIR) insulation manufactured in accordance with ASTM C-591, type IV "Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation". HITHERM insulation may be fabricated in half, curved sidewall or segmented sections.
- 3.1.2. Insulation shall have a thermal conductivity of 0.168 BTU-in/hr-ft<sup>2</sup>-°F or better at 75°F.
- 3.1.3. For applications where building code requires insulation to meet 25 flame spread and 50 smoke developed or less, insulation shall yield 25/50 or less in accordance with ASTM E84 at all thicknesses specified.

### **3.2. Adhesives/Mastics/Joint Sealers**

- 3.2.1. Solvent based adhesives, joint sealers and mastics may be used in contact with PIR300 25/50 insulation. Mastics shall remain flexible at the lowest expected ambient temperature.
- 3.2.2. Joint sealers for sealing joints of insulation shall be vapor retarder type, moisture and water resistant, non hardening, and flexible with a service temperature range from -30°F to +200°F.
- 3.2.3. A vapor retarder type joint sealer shall be applied on insulation longitudinal joints and butt joints to prevent moisture and moisture vapor infiltration. Please consult joint sealer manufacturer for recommended products.
- 3.2.4. Solvent or water adhesives may be used to attach the vapor barrier to the outer surface of the PIR300 25/50. Refer to the vapor barrier installation guidelines. Consult adhesive manufacturer's literature for instructions on handling adhesives including required operating temperatures.

### **3.3. Vapor Retarders**

- 3.3.1. HiTHERM recommends that the Vapor Retarder be factory or field applied to the outer surface of the pipe insulation.
- 3.3.2. HiTHERM recommends that the vapor retarder be factory applied by an authorized fabricator.
- 3.3.3. Vapor retarder shall have a maximum permeance of 0.02 perm. Refer to ASTM standards C-755 and C-1136 for information on selection and specification of vapor retarders. Refer to product literature and installation guidelines from the vapor retarder manufacturer for recommended application instructions. (Not congruent with standard practices in West coast due to relatively low humidity)
- 3.3.4. Elbows and fittings shall be wrapped with vapor retarder tape with a 50% overlap.
- 3.3.5. For other laminated membrane type vapor retarders, consult manufacturer's literature and installation guidelines.
- 3.3.6. Do not use staples, screws or other fastening devices that will penetrate the vapor barrier and cause instability in the system.
- 3.3.7. For tanks, vessels, and equipment, use similar Vapor Retarder Films or approved equal.

### **3.4. Tape**

- 3.4.1. Insulation shall be secured to the pipe with 3/4" wide fiber reinforced tape or manufacturer supplied tape if vapor retarder or other jacketing is field applied.
- 3.4.2. Outer layer insulation and vapor retarder shall be secured with fiber reinforced tape or supplied vapor retarder tape. Use a 25% circumferential overlap on 12" centers when vapor retarder is factory applied to insulation. Fiber tape or manufacturer supplied vapor retarder tape shall be applied to the exterior of the insulation/vapor retarder system.

### **3.5. Mechanical Jacketing**

#### **3.5.1. Indoor Applications**

- 3.5.1.1. For piping located in minimal mechanical abuse areas, the factory or field applied vapor retarder can be used at discretion of the design engineer. See section 3.4.2 for securement procedures.
- 3.5.1.2. If mechanical jacketing is required, it shall be polyvinylchloride (PVC). Consult manufacturer for recommended thickness.
  - 3.5.1.2.1. All PVC joints shall be solvent welded to prevent intrusion of moisture into the system.
- 3.5.1.3. Supply preformed and form fitting PVC covers for all fitting, valves, caps, tees, etc. at same thickness as straight piping.

- 3.5.1.4. **PVC shall not be considered a vapor retarder.**
- 3.5.1.5. **Do not use staples, screws or other fastening devices that will penetrate the mechanical and/or vapor barrier and cause instability in the system.**

### 3.5.2. **Outdoor Applications**

- 3.5.2.1. Mechanical jacketing outdoors shall be aluminum metal cladding. Jacketing shall be aluminum alloys 3003, 1100 or 3105 meeting ASTM B209 and contain polysurlyn\* moisture barrier.
- 3.5.2.2. All aluminum for fittings, tees, caps, etc. shall be factory supplied, field contoured or sectional to fit snugly around the insulation.
- 3.5.2.3. All joints shall be sealed with caulk to prevent intrusion of moisture into the system. Consult manufacturer for recommended products and application.
  - 3.5.2.3.1. Metal Bands - options are:
    - 3.5.2.3.1.1. Stainless steel bands shall be 0.5" x 0.020" with matching seals for piping, vessels, or equipment with O.D.'s of 48" or less.
    - 3.5.2.3.1.2. For larger O.D.'s, use 0.75" x 0.020" stainless steel bands.
- 3.5.2.4. **Aluminum jacketing shall not be considered a vapor barrier.**
- 3.5.2.5. **Do not use staples, screws or other fastening devices that will penetrate the mechanical and/or vapor barrier and cause instability in the system.**

## 4. **FABRICATION OF INSULATION**

- 4.1. Insulation shall be fabricated in required shapes from bun stock in accordance with ASTM C-450 "Standard Practice for Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments" and C-585 "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)". Insulation shall be factory fabricated from bun stock.
- 4.2. Fittings, such as valves, valve stations, flanges, 90° and 45° elbows, and tees shall be a two piece fly-cut or routed as the preferred fabrication method. For diameters too large for fly cutting or routing, the pieces shall be fabricated in two halves with each half made up of mitered sections. Both methods shall be in accordance with ASTM C-450 and ASTM C-585.
- 4.3. Store the bun stock at normal shop (indoor) conditions for at least 24 hours before fabrication. This will allow the PIR300 bun stock to equilibrate to the shop conditions. For best fabrication quality, it is recommended that PIR300 buns be fabricated into pipe shells in conveyor direction (36" direction) to maximize flatness.

## 5. **INSULATION THICKNESS**

- 5.1. The insulation thickness shall be calculated based on the design criteria for the system being insulated. These calculations can be performed by HiTHERM<sup>®</sup> by request of the designer or owner. Consideration should be given to process control, energy conservation, personnel protection and other necessary criteria.

## 6. **APPLICATION PROCEDURE**

### 6.1. **Indoor Piping**

- 6.1.1. In the temperature range of 35°F to 70°F, the insulation may be applied in a single layer using half segments or curved sidewall segments when applicable.
- 6.1.2. The insulation shall be applied to piping with all joints dry and tightly fitted to eliminate voids. All broken or non-conforming insulation shall be refitted or replaced.
- 6.1.3. Horizontal joints shall be placed at 3 o'clock and 9 o'clock to promote proper water shed.
- 6.1.4. All joints shall be sealed. See section 3.2.3 for proper application and selection.

\*surlyn is a registered trademark of DuPont

- 6.1.5. Insulation may be taped or banded in place taking care to ensure the insulation is not damaged during application. Banding or tape shall be installed on equal spacing and be a minimum of four inches (4") from the end of any insulation section. Refer to section 3.4 for proper taping procedures.
- 6.1.6. Fittings shall be insulated in a manner similar to piping. Where the outer diameter of fitting shall be the same as the outer diameter of the piping. If the outer diameters do not match, a beveled reducer shall be applied.
- 6.1.7. Apply vapor retarder jackets in accordance with manufacturer's recommendations, unless pre-applied by the fabricator.
- 6.1.8. Insulation shall be covered with mechanical jacketing in accordance with section 3.5.
- 6.1.9. Before installation of mechanical jacketing, the vapor barrier must be continuous and complete.

## **6.2. Outdoor Piping**

- 6.2.1. In the temperature range of 35°F to 70°F, the insulation may be applied in a single layer using half segments or curved sidewall segments when applicable.
- 6.2.2. The insulation shall be applied to piping with all joints dry and tightly fitted to eliminate voids. All broken or non-conforming insulation shall be refitted or replaced.
- 6.2.3. Horizontal joints shall be placed at 3 o'clock and 9 o'clock to promote proper water shed.
- 6.2.4. All joints shall be sealed. See section 3.2.3 for proper application and selection.
- 6.2.5. Insulation may be taped or banded in place taking care to ensure the insulation is not damaged during application. Banding or tape shall be installed on equal spacing and be a minimum of four inches (4") from the end of any insulation section. Refer to section 3.4 for proper taping procedures.
- 6.2.6. Fittings shall be insulated in a manner similar to piping. Where the outer diameter of fitting shall be the same as the outer diameter of the piping. If the outer diameters do not match, a beveled reducer shall be applied.
- 6.2.7. Apply vapor retarder jackets in accordance with manufacturer's recommendations, unless pre-applied by the fabricator.
- 6.2.8. Insulation shall be covered with aluminum type jacketing in accordance with section 3.5.2.
- 6.2.9. Before installation of mechanical jacketing, the vapor barrier must be continuous and complete.

## **6.3. Tanks, Vessels and Equipment**

- 6.3.1. Tanks, vessels and equipment shall be insulated with the same materials used on the piping related with the vessels, tanks and equipment.
- 6.3.2. Vessel and tank heads shall be insulated with curved or flat sections to ensure and form fit.
  - 6.3.2.1. Pieces shall be cut to avoid gaps and use the least number of pieces possible to reduce the number of through joints.
- 6.3.3. Vertical vessels and tanks greater than 4' in diameter require a support ring, welded or bolted, to prevent insulation from sliding down.
- 6.3.4. Secure the insulation with stainless steel banding on 12" centers
- 6.3.5. Legs and other attachments shall be insulated out 4 times the insulation thickness and sealed with a vapor stop.

## **7. INSPECTION**

- 7.1. Inspect all insulation and accessory materials to be certain they are applied in conformance with the specification recommendations stated above.
- 7.2. Joints should be tight, sealing and flashing should be thorough and watertight, and finished should be uniform and free of defects.

## **8. APPENDICES**

### **8.1. Corrosion Resistant Coatings**

8.1.1. **Stainless Steel-** HiTHERM recommends that all Type 300 Stainless Steel be covered with a corrosion resistant epoxy or paint at 5 mils thickness. Consult an epoxy or paint manufacturer for proper material and application procedures based on the operating conditions of the system.

8.1.2. **Carbon Steel-** HiTHERM recommends that Carbon Steel be coated with epoxy or corrosion resistant paint on temperatures ranging from +32°F to +300°F. Consult an epoxy or paint manufacturer for proper material and application procedures based on the operating conditions of the system.

**This specification has been prepared by HiTHERM 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, HiTHERM assumes that persons trained and qualified in the appropriate disciplines will make the actual design choices and installation. Therefore, HiTHERM disclaims all liability potentially arising from the use or misuse of this specification.**