

**SUBMITTAL REVIEW****CLIENT NAME:** Vails Gate Fire Department**PROJECT TITLE:** Vails Gate FD - New Firehouse**SUBMITTAL No.:** 230700-1**H2M PROJECT No.:** VGFD2001**SUBMITTAL NAME:** Pipe & HVAC Insulation**SUBMITTAL REVIEW**

**REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS.  
NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS  
OF DIMENSIONS OR DETAILS**

- |  |   |
|--|---|
| <input type="checkbox"/> NO EXCEPTIONS TAKEN   | <input type="checkbox"/> SUBMIT SPECIFIED ITEM  |
| <input checked="" type="checkbox"/> MAKE CORRECTIONS NOTED<br><small>(RESUBMISSION NOT REQUIRED)</small> | <input type="checkbox"/> NO ACTION TAKEN<br><small>(REVIEW IS THE RESPONSIBILITY OF ANOTHER PARTY)</small>  |
| <input type="checkbox"/> REVISE & RESUBMIT   | <input type="checkbox"/> NO ACTION TAKEN<br><small>(THIS SUBMITTAL IS NOT REQUIRED BY THE CONTRACT)</small> |
| <input type="checkbox"/> REJECTED - SEE REMARKS  | <input type="checkbox"/> RECEIVED FOR RECORD  |

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating their work with that of all other trades; and performing the work in a safe and satisfactory manner.

**H2M architects + engineers**

Date: 04/25/2023

By: MJV

Rev.: 2020-05-20

**Comments:**

See comment below.

CONTRACTOR'S COMPANY NAME  
ADDRESS

**SUBMISSION TRANSMITTAL FORM**  
**CLIENT NAME:** Vails Gate Fire District  
**PROJECT TITLE:** VGFD2001-New Firehouse

**H2M PROJECT NO.:** VGFD2001

Product, Item, or System Submitted:	Pipe & HVAC Insulation Product Data		
Submission Date:	4/4/2023	Submission Log No.:	230700-1
Specification Section:	230700	Paragraph Reference:	1.05.A
Contract Drawing Reference(s):			
Manufacturer's Name:			
Manufacturer's Mailing Address:			
Manufacturer's Contact Information:	Name	( ) Tel. no.	Email
Supplier's Name:	Joseph Lombardo Plumbing & Heating		
Supplier's Mailing Address:			
Supplier's Contact Information:	Name	( ) Tel. no.	Email
This item is a substitution for the specified item:	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
<p><b>KEY CONSTRUCTION SERVICES, LLC</b></p> <p><b>Project No: VGFD2001</b></p> <p><small>Reviewed for General Acceptance Only. This review does not relieve the Subcontractors or Suppliers of responsibility for making the work conform to the requirements of the contract. The Subcontractor and Suppliers are responsible for all dimensions, correct fabrication and accurate fit with the work of other trades.</small></p> <p><b><u>SUBJECT TO ARCHITECT AND OR ENGINEER APPROVAL</u></b></p> <p><b>Signed</b> <i>Joseph Manfredi</i> (PM) <b>Date:</b> 4/4/2023</p> <p>Contractor's Approval Stamp with Signature &amp; Date</p>		<p><b><u>Contractor's Brief Comments or Remarks</u></b> (attach separate letter as needed):</p> <p>By making this submission, we represent that we have determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving the item into the enclosed space, materials, catalog and model numbers and similar data and that we have checked and coordinated this submission with other work at or adjacent to the installed location in accordance with the requirements contained in the Contract Documents.</p>	

**END OF SECTION 013300**

Joe Lombardo
Plumbing & Heating of Rockland, Inc.

321 Spook Rock Road
Suffern, NY 10901
Ph. 845-357-6537 Fx 845-357-8529
E: info@josephlombardo.com
Website: www.josephlombardo.com

Rockland Cty. Plumbing #1000 Rockland Cty. Cooling # 1468
Westchester Cty. Plumbing #460 New Jersey State Plumbing #12702

TO: Key Construction
4246 Albany Post Rd. Suite 1
Hyde Park, NY 12538

LETTER OF TRANSMITTAL

Form with fields: DATE: 4-3-23, JOB NO., ATTENTION: Joe Manfredi, RE: Vails Gate Firehouse

WE ARE SENDING YOU [ ] Attached [ ] Under separate cover via the following items:
[ ] Shop Drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications
[ ] Copy of letter [ ] Change order [ ]

Table with 4 columns: EMAIL, DATE, NO., DESCRIPTION. Row 1: 1, 4-3-23, 230700 & 230719, HVAC INSULATION

THESE ARE TRANSMITTED as checked below:
[ ] For approval [ ] No Exceptions Taken [ ] Resubmit copies for review
[ ] For your use [ ] Make Corrections Noted [ ] Submit copies for distribution
[ ] As requested [ ] Rejected [ ] Return corrected prints
[ ] For review and comment [ ]
[ ] FOR BIDS DUE 20 [ ] PRINTS RETURNED AFTER LOAN TO US

COPY TO: Joe Manfredi SIGNED: Ronald J. Lombardo

# SCHEDULE OF INSULATION

ITEM NO	SYSTEM OR EQUIPMENT	LOCATION	SIZES	INSUL THK	PIPING, DUCT, OR EQUIPMENT				FITTINGS		REMARKS
					INSULATION MATERIAL	SECURED BY	FINISH	SECURED BY	INSULATION MATERIAL	FINISH	
1	Unlined Supply Duct	Interior Concealed	All	2-1/8"	R-6 .75# Fiberglass Wrap	Self Stick Pins + Tape	FSK	N/A	N/A	N/A	
2	HWSR Piping	Interior	<= 1-1/4" >= 1-1/2"	1" 1-1/2"	Fiberglass Pipe Covering	Self Seal	ASJ	SSL	Fiberglass insert	PVC	
3	Condensate Drain	Interior	All	1/2"	Closed Cell Insulation	Self Seal	Black UV resistant	N/A	Closed Cell Insulation	Black	
4	Refrigerant	All	All	1/2"	Closed Cell Insulation	Self Seal	Black UV resistant	N/A	Closed Cell Insulation	Black	

Minimum 1" thick per energy code.

PRODUCT DATA			
PRODUCT	MANUFACTURER	PRODUCT	MANUFACTURER
Ductwrap	CertainTeed, Johns Manville		
Fiberglass Pipe Covering	Johns Manville, Knauf		
PVC Covers	Proto, Johns Manville		
Closed Cell Insulation	Aerocell		

REVISION			
DATE			
JOB	<u>Vails Gate FD - HVAC</u>		
LOCATION	<u>Annex New Fire Station</u>		
CUSTOMER	<u>Joe Lombardo Plbg. &amp; Htg.</u>		

<b>Atlantic Contracting &amp; Specialties, LLC</b> <b>102 New South Road</b> <b>Hicksville, NY 11801</b>	
Phone: 516-261-9919	Submittal
Fax: 516-261-9925	Date 3/14/23
	By Tim Hartnett
Contract #13200201	

## SoftTouch™ and WideWrap™ Duct Wrap Insulation

### PRODUCT DESCRIPTION

**Basic Use:** SoftTouch™ and WideWrap™ Duct Wrap Insulation is used to insulate rectangular and round heating, ventilating and air-conditioning ductwork.

**Benefits:** SoftTouch and WideWrap provide thermal efficiency that reduces unwanted heat loss or gain from equipment and ductwork. When properly installed in the correct thickness, this product virtually eliminates condensation problems on cold duct surfaces. The 5' width accommodates larger ducts and means less labor, less wasted material and a cleaner installed appearance.

**Composition and Materials:** SoftTouch and WideWrap Duct Wrap is a blanket-type insulation composed of tan, uniformly textured, inorganic fibrous glass formed with a formaldehyde-free, plant-based binding agent. It is available unfaced or with FSK or white PSK vapor retarder facing. On faced products, a stapling/taping tab is provided on one edge.

**Limitations:** The product should be kept clean and dry from the time of manufacture through job site installation and system operation.

SoftTouch and WideWrap are suitable for use with most heating, ventilating and air-conditioning ductwork operating at temperatures from 35°F to 250°F (1.7°C to 121°C) for faced SoftTouch and WideWrap Duct Wrap and from 35°F to 450°F (1.7°C to 232°C) for unfaced.

**Sizes:** See table on back for available sizes. Contact CertainTeed for other sizes and minimum order quantities.

### INSTALLATION

Sheet metal ducts must be clean, dry and sealed tightly prior to insulating with CertainTeed SoftTouch and WideWrap Duct Wrap.

To ensure installed thermal performance, Duct Wrap must be cut to "stretch-out" dimensions. This requires measurement of the duct perimeter, then cutting the duct wrap to the dimensions (perimeter + add-on) indicated in the stretch-out table on the next page. A 2" piece of insulation is removed from the facing at the end of the piece of insulation to form an overlapping stapling and taping flap.



Product Name	CertainTeed SoftTouch™ and WideWrap™ Duct Wrap Insulation
Manufacturer	CertainTeed Corporation
Address	20 Moores Road Malvern, PA 19355
Phone	800-233-8990
Website	<a href="http://www.certainteed.com/technicalinsulation">www.certainteed.com/technicalinsulation</a>

### TECHNICAL DATA

#### Applicable Standards

- Model Building Codes:
  - ICC
- Material Standards:
  - ASTM C1290
    - Type I, Unfaced
    - Type III, FSK & PSK – White
  - ASTM C553
    - Type I, Type 75 Duct Wrap
    - Type II, Type 100 & 150 Duct Wrap
    - Type III, Type 150 Duct Wrap
  - CAN/CGSB-51.11-92
  - ASTM C1136: FSK & White PSK, Type II, Type IV
- Fire Safety Standards:
  - NFPA 90A, NFPA 90B

#### Fire Resistance

- Fire Hazard Classification:
  - UL 723, ASTM E84, CAN/ULC-S102
  - Max. Flame Spread Index: 25
  - Max. Smoke Developed Index: 50
- Non-Combustible:
  - ASTM E136
  - Meets test requirements

#### Physical/Chemical Properties

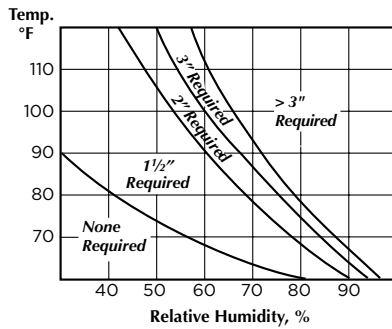
- Thermal Performance:
  - See table on other side
- Operating Limits:
  - Temperature: ASTM C411
  - Faced: Max. 250°F / 121°C
  - Unfaced: Max. 450°F / 232°C
- Water Vapor Sorption:
  - ASTM C1104
  - < 5% by weight
- Water Vapor Transmission – Facing:
  - ASTM E96, Desiccant Method
  - FSK and white PSK: Max. 0.02 perms (1.15 x 10<sup>-9</sup> g/Pa•s•m<sup>2</sup>)
- Corrosiveness:
  - ASTM C665 / Pass testing
- Fungi Resistance:
  - ASTM C1338 / Pass testing
- Odor Emission:
  - ASTM C1304 / Pass testing

#### Quality Assurance



CertainTeed's commitment to quality and the environment has ensured the registration of the Athens, Chowchilla and Kansas City plants to ISO 9001 and ISO 14001 Quality and Environmental Management System standards.

### CONDENSATION CONTROL



This chart is based on indoor conditions so far as wind and other factors are concerned.

To determine thickness to prevent condensation, based on installed thickness at 75% of nominal (out-of-package) thickness and a duct internal air temperature of 55°F, refer to the condensation control chart.

To use:

- 1) Select maximum relative humidity (%) on lower axis;
- 2) Read up vertically until that line intersects the maximum ambient air temperature;
- 3) Select the thickness indicated at the point of intersection.

### THERMAL PERFORMANCE

Type	Product Thickness		Uncompressed R-Value		Installed Duct R-Value		Uncompressed K-Value		Installed Duct K-Value	
			h•ft²•°F / Btu		h•ft²•°F / Btu		Btu•in / h•ft²•°F		Btu•in / h•ft²•°F	
	in.	mm	m²•°C / W	m²•°C / W	m²•°C / W	m²•°C / W	W / m²•°C	W / m²•°C	W / m²•°C	W / m²•°C
75	1	25	3.4	0.61	2.8	0.49	0.29	0.042	0.27	0.039
	1 1/2	38	5.2	0.91	4.2	0.74	0.29	0.042	0.27	0.039
	2	51	6.9	1.21	5.6	1.00	0.29	0.042	0.27	0.039
	2 1/2	54	7.3	1.29	6.0	1.06	0.29	0.042	0.27	0.039
	3	76	10.3	1.82	8.3	1.46	0.29	0.042	0.27	0.039
100	4	102	13.8	2.43	11.0	1.94	0.29	0.042	0.27	0.039
	1	25	3.8	0.68	3.0	0.53	0.26	0.038	0.25	0.036
	1 1/2	38	5.8	1.02	4.5	0.79	0.26	0.038	0.25	0.036
150	2	51	7.7	1.35	6.0	1.06	0.26	0.038	0.25	0.036
	1	25	4.2	0.73	3.2	0.56	0.24	0.035	0.23	0.033
	1 1/2	38	6.3	1.10	4.8	0.85	0.24	0.035	0.23	0.033
	2	51	8.3	1.47	6.4	1.13	0.24	0.035	0.23	0.033

Tested in accordance with ASTM C518 and/or ASTM C177 at 75°F (24°C) mean temperature. R means resistance to heat flow. The higher the R-value, the greater the insulating power. The installed R-value and K-value are based upon 25% compression of the product thickness during installation. To get the installed R-value, it is essential that this insulation be installed properly. If you do it yourself, follow the installation instructions carefully.

### INSTALLATION STRETCH-OUT DIMENSIONS

Product Label Thickness		Average Installed Thickness			Stretch-Out Dimensions¹					
					Round Duct		Square Duct		Rectangular Duct	
					in.	mm	in.	mm	in.	mm
1	25	0.75	19	P+	7	178	6	152	5	127
1 1/2	38	1.13	29	P+	9.5	241	8	203	7	178
2	51	1.50	38	P+	12	305	10	254	8	203
2 1/2	54	1.59	40	P+	12.6	321	10.4	270	8.4	213
3	76	2.25	57	P+	17	432	14.5	368	11.5	292
4	102	3.00	76	P+	22	559	18.5	470	14.5	368

¹The stretch-out dimension is equal to the duct perimeter (P) plus the add-on factor for the type of duct being installed.

### AVAILABLE SIZES

Product Type	Thickness		Length		Width	
	in.	mm	ft.	m	in.	mm
75	1	25	100	30.5	48	1219
	1 1/2	38	100	30.5		
	2	51	75	22.9		
	2 1/2	54	75	22.9		
	3	76	50	15.2		
100	1	25	100	30.5		
	1 1/2	38	100	30.5		
	2	51	75	22.9		
150	1	25	100	30.5		
	1 1/2	38	75	22.9		
	2	51	50	15.2		

**CertainTeed**  
SAINT-GOBAIN

**CertainTeed Corporation**

CEILINGS • DECKING • FENCE • GYPSUM • INSULATION • RAILING • ROOFING • SIDING • TRIM

20 Moores Road Malvern, Pa 19355 Professional: 800-233-8990 Consumer: 800-782-8777 [certainteed.com](http://certainteed.com)



**NAIMA**  
NORTH AMERICAN INSULATION  
MANUFACTURERS ASSOCIATION



Cert. #000213

SoftTouch and WideWrap are installed by wrapping the insulation around the perimeter of the duct with the facing out. Adjacent sections of duct wrap are tightly butted with the 2" taping flap overlapping. Seams must be stapled with outward-clinching staples on approximately 6" centers. When a vapor retarder is required, all seams, joints, tears, punctures and/or other penetrations of the duct wrap must be sealed with a pressure-sensitive vapor retarder tape that matches the facing, or a suitable mastic system.

Where rectangular ducts are 24" in width or greater, Duct Wrap must be additionally secured to the bottom of the duct with mechanical fasteners spaced 18" on center to prevent sagging.

For additional installation details, consult the National Commercial and Industrial Insulation Standards (current edition) published by the Midwest Insulation Contractors Association (MICA).

## **AVAILABILITY AND COST**

Manufactured and sold throughout the United States. Available in select Western U.S./Canada regions. For availability and cost, contact your local distributor or call CertainTeed Sales Support Group at 800-233-8990.

## **WARRANTY**

Refer to CertainTeed's Limited Warranty for Fiberglass Duct Wraps (30-32-113).

## **MAINTENANCE**

An inspection and preventative maintenance program for the HVAC system is recommended to ensure optimum performance.

## **TECHNICAL SERVICES**

Technical assistance can be obtained either from your local CertainTeed sales representative, or by calling CertainTeed Sales Support Group at 800-233-8990.

## DESCRIPTION

Microlite® FSK Formaldehyde-free™ duct wrap insulation is a lightweight, highly resilient, blanket-type thermal insulation. The insulation blanket is manufactured from rotary-process fiberglass bonded with a formaldehyde-free resin.

## AVAILABLE FORMS

Microlite Formaldehyde-free™ insulation is available in a variety of densities, thicknesses and roll lengths. It is supplied with an FSK (foil-scrim-kraft) vapor barrier facing to meet installed performance requirements, with a 2" (51 mm) stapling tab. Microlite FSK is 48" (1219mm) wide.

## USES

Microlite insulation is recommended as thermal insulation for the exterior of HVAC systems or other spaces or surfaces where temperature control is required.

## LIMITATION

Microlite FSK duct wrap is not recommended for use on duct systems in service at temperatures above 250°F (121°C). It should not be used in weather-exposed applications without proper protection.

## STORAGE

Microlite FSK duct wrap should be kept clean and dry during storage, transport, installation, and system operation.

## FACING INFORMATION

FSK Aluminum Foil

Reinforced with fiber glass scrim laminated to UL-rated kraft.

Permeance: 0.02 perms\*

\*Per ASTM E96, Procedure A for facing material prior to lamination. After lamination, permeance values may be higher.

## GENERAL PROPERTIES

Temperature (max.) – ASTM C411	250°F (121°C)
Water vapor sorption – ASTM C1104	<5% by weight
Corrosivity with steel – ASTM C665	Does not accelerate
Fungi resistance – ASTM C1338	Does not breed or promote

## STANDARD THICKNESSES AND PACKAGING

	100' Roll (31 m)	75' Roll (23 m)	50' Roll (15 m)	45' Roll (13.7 m)	35' Roll (10.6 m)	30' Roll (9.14 m)
Type	Thickness, in (mm)					
75	1 (24)*, 1 ½ (38)	2 (51), 2½ (56)	3 (76),	4 ⅔ (112)	5 ¾ (146)	7 (178)
100	1 ½ (38)	2 (51)	–			
150	–	1 ½ (38)	2 (51)			

\*1" for Canadian use only

Note: Additional thicknesses, widths and other lengths available on special order. Contact Regional Sales Office for availability.

## RECYCLED CONTENT



AVERAGE 27% RECYCLED CONTENT  
POST-CONSUMER

HVAC-448 12/17/20 (Replaces 10/23/20)



## SURFACE BURNING CHARACTERISTICS

**Microlite insulation meets the Surface Burning Characteristics and Limited Combustibility of the following standards:**

Standard/Test Method

- ASTM E84
- UL 723
- NFPA 90A and 90B
- UL Guide No. 40 U8.3. Card R3711
- CAN/ULC S102

Maximum Flame Spread Index	25
Maximum Smoke Developed Index	50

Note: Faced materials are tested as composite products (insulation, adhesive and facing).

## SPECIFICATION COMPLIANCE

ASTM C1290 Type 75, 100, & 150

ASTM C553\*

Type I, Type II Type 75 & 100  
Type I, Type II, Type III Type 150

\*For faced material: 250°F (121°C) maximum temperature.

ASTM C1136s†

Type II FSK Facing

†Replaces HH-B-100B, Type II.

Canada: CGSB 51-GP-11M

NYC MEA 40-75-M

## SUSTAINABLE BUILDING CERTIFICATIONS

GREENGUARD®	Certified
GREENGUARD® GOLD	Certified
FORMALDEHYDE FREE	Validated

GREENGUARD® Certified products have been screened for more than 10,000 volatile organic compounds (VOCs) and meet stringent standards for low chemical emissions based on established criteria from key public health agencies. This product is also a UL Validated Formaldehyde-Free product, meeting recommendations established by the California Air Resources Board and the EPA to use building materials and insulation made without formaldehyde.





# MICROLITE® FSK

## FSK-FACED FORMALDEHYDE-FREE™ FIBERGLASS DUCT WRAP

### DATA SHEET

#### APPLICATION RECOMMENDATIONS

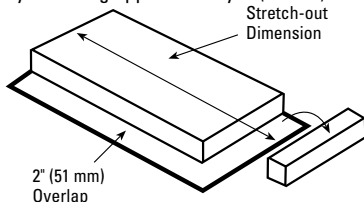
The R-value will vary depending upon how much the insulation is compressed during installation. To obtain the published installed R-values, the insulation stretch-out should be determined using the following table:

#### Duct Wrap Stretch-outs

Labeled Thick. (in)	Installed Compressed Thickness (in)	Round	Square	Rectangular
1	0.75	P+ 7.0"	P+ 6.0"	P+ 5.0"
1½	1.125	P+ 9.5"	P+ 8.0"	P+ 7.0"
2	1.50	P+ 12.0"	P+ 10.0"	P+ 8.0"
2 ½	1.65	P+ 13.0"	P+ 11.0"	P+ 8.5"
3	2.25	P+ 17.0"	P+ 14.5"	P+ 11.5"
4 ½	3.30	P+ 24.5"	P+ 21.0"	P+ 19.0"
5 ¾	4.31	P+ 30.0"	P+ 27.0"	P+ 25.0"
7	5.25	P+ 36.0"	P+ 33.0"	P+ 31.0"

Stretch-outs include 2" (51 mm) for overlap. P = perimeter of duct to be insulated.

Prepare overlap by removing approximately 2" (51 mm) of insulation from facing.



Before applying duct wrap, sheet metal duct shall be clean, dry and tightly sealed at all joints and seams.

Wrap insulation around duct with facing to the outside so the 2" (51 mm) flap completely overlaps facing and insulation at the other end of stretch-out. Insulation shall be snugly butted.

Secure seams with outward clinching staples placed approximately 6" (152 mm) on center. If required, seal seam with pressure-sensitive tape designed for use with duct insulation. Insulation on the underside of ducts spanning 24" (610 mm) or greater shall be secured with mechanical fasteners and speed clips spaced approximately 18" (457 mm) on center. Fasteners should be cut off flush after the speed clips are installed, and when required, sealed with the same tape as specified above.

Adjacent sections of duct wrap insulation shall be snugly butted with the circumferential 2" (51 mm) tape flap overlapping and secured as recommended for the longitudinal seam. When a vapor seal is required, two coats of vapor retarder mastic reinforced with one layer of 4" (102 mm) wide, open-weave glass fabric may be used in lieu of pressure-sensitive tape.

#### GUIDE SPECIFICATIONS

**Insulation for Metal Ducts.** All ducts shall be insulated on the outside with a Formaldehyde-free™, flexible glass fiber blanket. Microlite Formaldehyde-free™ fiber glass duct wrap insulation should have a minimum installed R-value\* of \_\_\_\_\_, and a Type \_\_\_\_\_ facing. Insulation shall be furnished with a factory-applied facing with a composite UL FHC rating of 25/50.

\*The minimum insulation installed R-value should be determined in accordance to the duct operating and ambient conditions.

#### THERMAL CONDUCTIVITY (ASTM C518)

Type	k* Compressed Thickness Btu•in/(hr•ft²•°F)	W/m•°C	k Labeled Thickness Btu•in/(hr•ft²•°F)	W/m•°C
75	0.27	0.039	0.29	0.042
100	0.25	0.036	0.27	0.039
150	0.24	0.035	0.25	0.036

Conductivity at 75°F (24°C) mean temperature.

\*Tested with material thickness compressed 25%.

#### INSTALLED R-VALUES

Type	Labeled Thickness in	mm	Installed "R"*** (hr•ft²•°F)/Btu	m²•°C/W	Out-of-Package "R" (hr•ft²•°F)/Btu	m²•°C/W
<b>Type 75 - 0.75 pcf (12kg/m³)</b>						
75	1	25	3.0	0.53	3.8	.67
	1½	38	4.2	0.74	5.2	0.92
	2	51	5.6	0.99	6.9	1.22
	2 ½	56	6.0	1.08	7.5	1.33
	3	76	8.3	1.46	10.3	1.81
	4 ½	112	12.0	2.16	15.0	2.66
	5 ¾	146	16.0	2.82	20.0	3.52
	7	178	19.0	3.35	23.0	4.05
<b>Type 100 - 1.00 pcf (16kg/m³)</b>						
100	1½	38	4.5	0.79	5.6	0.99
	2	51	6.0	1.06	7.4	1.30
<b>Type 150 - 1.5 pcf (24kg/m³)</b>						
150	1½	38	4.7	0.83	6.0	1.06
	2	51	6.3	1.11	8.0	1.41

\*\*\*Installed R-value calculated with a material thickness compressed to a maximum of 25% following recommended duct wrap stretch-outs.



717 17th St.  
Denver, CO 80202  
800-654-3103  
www.JM.com

#### North American Sales Offices, Insulation Systems

##### Eastern Region & Canada

P.O. Box 158  
Defiance, OH 43512  
800-334-2399  
Fax: 419-784-7866

##### Western Region & Outside North America

P.O. Box 5108  
Denver, CO 80217  
800-368-4431  
Fax: 303-978-4661

Technical specifications as shown in this literature are intended to be used as general guidelines only. Please refer to the Safety Data Sheet and product label prior to using this product. The physical and chemical properties of Microlite FSK listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Any references to numerical flame spread or smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

All Johns Manville products are sold subject to Johns Manville's standard Terms and Conditions, which includes a Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville standard Terms and Conditions or for information on other Johns Manville thermal insulation and systems, visit [www.jm.com/terms-conditions](http://www.jm.com/terms-conditions) or call (800)654-3103.

### DESCRIPTION

Micro-Lok HP fiberglass pipe insulation is a high-performance insulation made from biosoluble glass fibers bonded with a thermosetting resin and produced in 36" (0.92 m) lengths. Micro-Lok HP insulation is used to insulate standard iron pipe, plastic pipe and copper tubing. The 3' (0.92 m) sections are available plain or with a factory-applied vapor-barrier jacket. The all-service (ASJ) vapor-retarder jacket includes a longitudinal, self-sealing closure lap. The jacket system is adhered to each fiberglass section using a specially formulated adhesive to ensure jacket securement.

The factory-installed tape system permits installation at ambient temperatures down to 20°F (-7°C) and will not soften or separate when exposed to high ambient temperatures and humidity.

### USES

Micro-Lok HP fiberglass pipe insulation is suitable for installation over hot, cold, concealed and exposed piping systems with operating temperatures up to 850°F (454°C). Weather-protective jacketing is required for outdoor applications. Pipes operating below ambient temperatures require all joints to be sealed with the factory-applied, self-seal lap and butt strips. Micro-Lok HP is UL listed and labeled over plastic pipes for air plenum applications when used at 1.0" thickness or greater.

### PHYSICAL PROPERTIES

Service Temp. Range (ASTM C411)	0°F to 850°F (-18°C to 454°C)
Moisture Sorption	<5% by weight
Corrosivity (ASTM C1617)	<5 ppm chloride standard
Shrinkage (ASTM C356)	None
Microbial Growth (ASTM C1338)	Does not promote microbial growth
Surface Burning Characteristics	Composite FHC 25/50 per ASTM E84, NFPA 255, CAN/ULC S102.2
Limited Combustibility	NFPA 90A and 90B
<b>Jacketing</b>	ASTM C1136 (Type I & II)
Water Vapor Permeance (ASTM E96 – Procedure A)	0.02 perms max.
Burst Strength (ASTM D774)	55 lbs/in <sup>2</sup> (4.6 Kg/cm <sup>2</sup> )
Tensile Strength (ASTM D828)	45 lbs./in. (7.9N/mm) width min. (MD) 30 lbs./in. (5.23N/mm) width min. (CD)

### SPECIFICATION COMPLIANCE

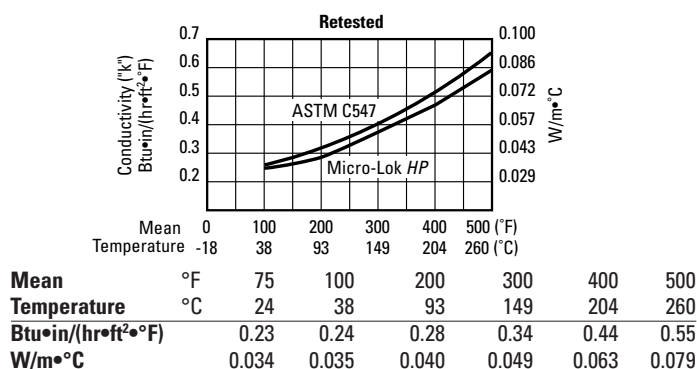
- ASTM C547 Type I (Replaces HH-I-558B, Form D, Type III, Class 12, Class 13 up to 850°F [454°C])
- ASTM C585 – Dimension Standard
- ASTM C1136 (Jacketing) (Replaces HH-B-100B, Type I & II)
- MIL-DTL-32585 Type 1, Form 4, Facing A ([unjacketed only](#))
- MIL-I-22344D, MIL-PRF-22344E
- Coast Guard/IMO Approved 164.109/56/0 (plain, unjacketed only – excluding 7/8 x 1/2 [22 mm x 13 mm], 1/2 x 1/2 [13 mm x 13 mm])
- Bureau of Household Goods and Services CA-T1039 (CO)
- Firestop Assemblies: Meets requirement for jacketed fiberglass pipe insulation product density at or above 3.5 pcf.
- ASTM E84, CAN ULC S102.2 – 25/50 listed and labeled Intertek testing laboratories, listed and labeled Underwriter Laboratories
- NRC 1.36, ASTM C795, MIL-I-24244C, MIL-DTL-24244D\*

\*When ordering material to comply with these specifications a statement of that fact must appear on the purchase order. Specific lot testing will be conducted and a certification of compliance can be provided.

**Operating Temperature Limits:** 0°F to 850°F (-18°C to 454°C)



### THERMAL CONDUCTIVITY ("K") \*



\* Apparent thermal conductivity values are determined by applying procedures dictated per ASTM C1045 on test data obtained using ASTM Test Method C335. All values are based on nominal manufacturing and testing parameters, are subject to normal variation, and are not guaranteed for specification purposes or otherwise.

### SUSTAINABLE BUILDING ATTRIBUTES

Manufacturing Location	Defiance, Ohio (43512)	
Recycled Content (glass only)	41%	
Recycled Content (total product)	28%	
Volatile Organic Compounds (ASTM D5116)	Total	0.22 g/l
(Analysis ASTM D6196 & ASTM D5197)		
Fiberglass Pipe Insulation	Formaldehyde	0.009 ppm
	Aldehydes	0.043 ppm
Volatile Organic Compounds (Calculated)	Total	<49 g/l
Self-Sealing Lap & Butt Strips		

### SUSTAINABLE BUILDING CERTIFICATIONS

GREENGUARD®	Certified
GREENGUARD® GOLD	Certified
LEED® Credits	To see LEED info call technical support
LEED-NC	



**SIZE AVAILABILITY**

Insulation Thickness		Iron Pipe Size Range		Copper Tubing Size Range	
in.	mm	in.	mm	in.	mm
½	13	½–6	13–152	⅝–4⅞ <sup>§</sup>	16–105
1	25	½–24	13–610	⅝–6⅞	16–156
1½	38	½–24	13–610	⅝–6⅞	16–156
2	51	½–24	13–610	1⅞–6⅞	29–156
2½	64	1–24	25–610	1⅞–6⅞	35–156
3	76	1–24	25–610	1⅞–6⅞	35–156
3½	89	1½–24*	38–610	—	—
4	102	3–24**	76–610	—	—
4½	114	3–24†	76–610	—	—
5	127	3–20††	76–508	—	—

**Notes:**

\*2½" and 23" IPS not available in this insulation thickness.

\*\*22" and 23" IPS not available in this insulation thickness.

†21", 22" and 23" IPS not available in this insulation thickness.

††19" IPS not available in this insulation thickness.

§3⅝" CTS not available in this insulation thickness.

**QUALIFICATIONS FOR USE**

A sufficient thickness of insulation must be used to keep the maximum surface temperature of Micro-Lok HP insulation below 150°F (66°C). In addition, at operating temperatures above 500°F (260°C), Micro-Lok HP pipe insulation must be applied in a thickness ranging from 2" (51 mm) minimum to 6" (152 mm) maximum.

During initial heat-up to operating temperatures above 350°F (177°C), an acrid odor and some smoke may be given off as the organic binders used in the fiberglass pipe insulation begin to decompose. When this occurs, caution should be exercised to ventilate the area well. This loss of binder does not directly affect the thermal performance of the pipe insulation, but the compressive strength and resiliency of the product are reduced. For applications with excessive physical abuse or vibration at high temperatures, consult your local Insulation Systems Market Development Manager for alternate material recommendations.

**CHILLED WATER SYSTEMS**

For chilled water systems, see [3-Part Specification, MECH-261](#).

**APPLICATION RECOMMENDATIONS\*****MICRO-LOK HP PIPE INSULATION AND BUTT STRIPS**

1. Do not apply Micro-Lok HP insulation if air temperature is below 20°F (-7°C) or above 130°F (54°C) due to the effect of temperature on tape performance. We recommend stapling when application falls outside this temperature range.

When stapling, we recommend mastic be applied over staples to prevent moisture penetration.

2. If stored below 20°F (-7°C) or above 130°F (54°C), insulation cartons should stand within the recommended temperature range for 24 hours prior to application.

3. Once release paper is removed, both adhesive and lap must be kept free of dirt and water, and the lap sealed immediately.

4. When adhered, the lap and butt strips must be pressurized by rubbing firmly with a plastic squeegee or the back of a knife blade to ensure positive closure.

\*For complete application recommendations and installation instructions, see MECH-261 InsulSpec Specifications.

**North American Sales Offices,  
Insulation Systems****Eastern Region and Canada**

P.O. Box 158  
Defiance, OH 43512  
800-334-2399  
Fax: 419-784-7866

**Western Region**

P.O. Box 5108  
Denver, CO 80217  
800-368-4431  
Fax: 303-978-4661

Technical specifications as shown in this literature are intended to be used as general guidelines only. Please refer to the Safety Data Sheet and product label prior to using this product. The physical and chemical properties of Micro-Lok HP listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Any references to numerical flame spread or smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with your customer service representative for current information.

**All Johns Manville products are sold subject to Johns Manville's standard Terms and Conditions, which includes a Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville standard Terms and Conditions or for information on other Johns Manville thermal insulation and systems, visit [www.jm.com/terms-conditions](http://www.jm.com/terms-conditions) or call (800)654-3103.**

## DATA SHEET

# Earthwool® 1000° Pipe Insulation

with ECOSE® Technology



### DESCRIPTION

Earthwool 1000° Pipe Insulation is a molded, one-piece insulation made from highly resilient, inorganic glass fibers bonded with ECOSE Technology.

### APPLICATION

- Iron, copper, stainless steel, PVC, and CPVC piping
- Hot, cold, concealed and exposed piping systems operating at temperatures 0° F-1000° F (-18° C to 538° C)
- Additional weather protection is needed for outdoors use

### SPECIFICATION COMPLIANCE

#### U.S.

- ASTM C547; Type I, Type IV
- ASTM C585
- ASTM C1136 (jacket); Type I, II, III, IV, VII, VIII, X
- NFPA 90A and 90B
- Conformity for fit Marine Equipment IMO 1408
- MIL-DTL-32585; Type 1, Form 4, Facing A and D
- USCG 164.109/4/1
- UL/ULC Classified

- ASTM C795, MIL-I-24244, NRC Reg. Guide 1.36 (Certification needs to be specified at time of order)

#### Canada

- CAN/ULC S102
- CGSB 51-GP-9M
- CGSB 51-GP-52M (jacket)
- CAN/CGSB-51.9 (obsolete, replaced by ASTM C547)

CONTRACTOR: \_\_\_\_\_

JOB: \_\_\_\_\_

DATE: \_\_\_\_\_

### DOING MORE FOR THE WORLD WE LIVE IN.

Knauf Insulation products with ECOSE® Technology are made using our patented, bio-based binder - a smarter alternative to the phenol/formaldehyde (PF) binder traditionally used in fiberglass products. The bio-based binder holds our product together and gives the product its unique appearance.

All of our products are formaldehyde-free and made from sustainable resources, such as recycled glass and sand. And we're proud to be putting glass bottles back to work rather than into landfills. Our products are made with a minimum of 50% recycled glass—totaling an average of 26 million bottles each month.



### TECHNICAL DATA

Property (Unit)	Test	Performance
Corrosiveness	ASTM C665	Does not accelerate corrosion of steel
Corrosion	ASTM C1617	Pass
Maximum Service Temperature	ASTM C411 + ASTM C447	1000° F (538° C)
Water Vapor Permeance	ASTM E96, Procedure A	0.01 perms or less
Water Vapor Sorption (by weight)	ASTM C1104	Less than 5%
Shrinkage	ASTM C356	Negligible
Mold Growth	ASTM C1338	Pass
Surface Burning Characteristics (flame spread/smoke developed)	ASTM E84, UL 723, CAN/ULC S102	UL/ULC Classified FHC 25/50

## INDOOR AIR QUALITY

- UL Environment
  - GREENGUARD Certified
  - GREENGUARD Gold Certified
  - Validated to be Formaldehyde-Free
- Does not contain polybrominated diphenyl ethers (PBDE) such as: Penta-BDE, Octa-BDE or Deca-BDE
- EUCEB Certified
- IgCC Section 806.6 compliant

## PRODUCT FORMS AND SIZES

- Produced in 3' (914 mm) sections
- For iron pipe ½" – 24" (15 mm – 610 mm) nominal pipe size
- For copper tube ⅝" – 6⅞" (16 mm – 156 mm)
- All insulation inner and outer diameters comply with ASTM C585.

- Wall thicknesses from ½" to 6" (13 mm to 152 mm) in single layer for most sizes
- With or without a white, factory-applied jacket, ASJ+ (all-service jacket) is composed of aluminum foil, reinforced with a glass scrim bonded to a kraft paper interleaving with an outer film layer leaving no paper exposed.
- A matching ASJ+ butt strip is supplied for each section
- The longitudinal lap of the jacket has the SSL+ self-sealing lap that creates a strong and lasting bond

## Packaging

- Four carton sizes for easy ordering, inventory tracking and storage
- Reinforced carton handles for strength and easy lifting
- Bar-coded cartons for accurate shipments and tracking
- Full product range stocked at distributors for fast availability

## THERMAL CONDUCTIVITY | ASTM C335

Mean Temperature	k	k (SI)
75° F (24° C)	0.23	0.033
100° F (38° C)	0.24	0.035
200° F (93° C)	0.28	0.040
300° F (149° C)	0.34	0.049
400° F (204° C)	0.42	0.061
500° F (260° C)	0.51	0.074
600° F (316° C)	0.62	0.089

## ASHRAE 90.1-2016 REQUIREMENTS

MINIMUM PIPE INSULATION THICKNESS								
Fluid Operating Temperature Range and Usage	Insulation Conductivity		Nominal Pipe or Tube Size					
	Conductivity Range BTU-in./(hr · ft² · °F)	Mean Temperature Rating	<1"	1"-<1½"	1½"-<4"	4"-<8"	≥8"	
<b>Heating and Hot Water Systems (Steam, Steam Condensate, Hot-Water Heating and Domestic Water Systems)</b> a, b, c, d								
Above 350° F	0.32–0.34	250° F	4½"	5"	5"	5"	5"	
251–350° F	0.29–0.31	200° F	3"	4"	4½"	4½"	4½"	
201–250° F	0.27–0.30	150° F	2½"	2½"	2½"	3"	3"	
141–200° F	0.25–0.29	125° F	1½"	1½"	2"	2"	2"	
105–140° F	0.22–0.28	100° F	1"	1"	1½"	1½"	1½"	
<b>Cooling Systems (Chilled Water, Brine, Refrigerant)</b> a, b, c, d								
40–60° F	0.21–0.27	75° F	½"	½"	1"	1"	1"	
Below 40° F	0.20–0.26	50° F	½"	1"	1"	1"	1½"	

a. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:  $T = r \{ (1 + t/r)^{K/k} - 1 \}$ , where T=minimum insulation thickness (in.), r=actual outside radius of pipe (in.), t=insulation thickness listed in this table for applicable fluid temperature and pipe size, K=conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu · in.(h · ft² · °F)); and k=the upper value of the conductivity range listed in this table for the applicable fluid temperature.

b. These thicknesses are based on energy efficiency considerations only.

c. For piping smaller than 1½" and located in partitions within conditioned spaces, reduction of these thicknesses by 1" shall be permitted (before thickness adjustment required in footnote a) but not to thicknesses below 1". These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.

d. The table is based on steel pipe. Non-metallic pipes schedule 80 thickness or less shall use the table values. For other non-metallic pipes having thermal resistance greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot than a steel pipe of the same size with the insulation thickness shown on the table.



## PRECAUTIONS

### Hot Pipe

- May be installed while the system is in operation, at all temperatures up to 1000° F (538° C).
- Knauf Insulation recommends, for insulation thicknesses greater than 6" (152 mm), the temperature must be increased from 500° F (260° C) to maximum temperature at a rate not exceeding 100° F (37.8° C) per hour.
- During initial heat-up to operating temperatures above 350° F (177° C), a slight odor and some smoke may be given off as a portion of the bonding material used in the insulation begins to undergo a controlled decomposition.
- If natural convection is not adequate in confined areas, forced ventilation should be provided in order to protect against any harmful fumes and vapors that might be generated.
- Care must also be taken when using sealants, solvents or flammable adhesive during installation.
- A maximum of 6" (152 mm) wall thickness is recommended.

### Cold Pipe

- Use a continuous vapor retarder on piping operating below ambient temperatures.
- Seal all joints, surfaces, seams and fittings to prevent condensation.
- On below freezing applications, and in high-abuse areas, the ASJ+ jacket shall be protected with a PVC vapor retarding outer jacket. In addition, exposed ends of insulation shall be sealed with vapor barrier mastic installed per the mastic manufacturer's instructions. Vapor seals at butt joints shall be applied at 12' to 21' intervals; at the Engineer's discretion and at each fitting to isolate any water incursion.
- On chilled water systems operating in high humidity conditions, it is recommended that the same guidelines be followed as listed above for below freezing applications.
- Exterior hanger supports are recommended.

### Outside Application

- Do not expose pipe insulation to weather. It must be covered with appropriate jacketing, mastic or vapor retardant coatings.
- All exposed surfaces must be protected. Proto® Indoor/Outdoor PVC Jacketing is recommended. See Knauf Insulation Guide Specifications for recommended PVC jacketing application guidelines.
- Apply jacketing, mastics or vapor retardant adhesives per manufacturer's instructions.
- For metallic jackets, factory-applied moisture retarders are recommended.

### ASJ+ SSL+

- Keep adhesive and contact surfaces free from dirt and water. Seal immediately once adhesive is exposed.

- Apply when ambient and insulation temperatures are between 20° F and 130° F (-6.7° C and 54° C).
- If stored below 20° F or above 130° F, allow insulation cartons to stand within recommended temperature range for 24 hours prior to application.
- Do not store product below -20° F (-29° C) or above 150° F (66° C).
- When using Knauf Insulation's SSL+ Advanced Closure System, make sure the longitudinal and circumferential joints are properly sealed by rubbing the closure firmly with a squeegee. Use of staples is not recommended.
- When using Earthwool® 1000° pipe insulation, the surface temperature of the ASJ+ facing should not exceed 150° F (66° C).

### Fittings and Hangers

- Use Proto 25/50 Rated (ASTM E84) PVC Fitting Covers, applying PVC fittings per Proto's Data Sheet.
- Fittings should be insulated to same thickness as the adjoining insulation.
- Apply fittings per manufacturer's instructions.
- When required by specification, a hard insert of sufficient length should be used to avoid compression of the insulation.

## APPLICATION GUIDELINES

### Storage

- Protect insulation from water damage or other abuse, welding sparks and open flame.
- Cartons are not designed for outside storage.

### Preparation

- Apply only on clean, dry surfaces
- Pipe or vessel should be tested and released before insulation is applied.

### General Guidelines

- All sections should be firmly butted.
- Seal circumferential joint with a minimum 3" (76 mm) wide butt strip.
- Jackets, coating and adhesives should have a comparable F.H.C. rating.
- ASJ+ may be painted. As with traditional ASJ, Knauf Insulation does not encourage the painting of ASJ+ because the application of any paint may change the surface burning characteristics and will void the UL Classification and Knauf Insulation Limited Warranty.

## APPLICATION & SPECIFICATION GUIDELINES

### Storage

- Protect material from water damage or other abuse. Cartons are not designed for outside storage. Vacuum packaged material can be stored outside if care is taken not to puncture the poly bag.

### Preparation

- Apply the product on clean, dry surfaces. Metal ducts must be sealed before application. Prescore rigid insulation board where necessary to conform to curved surfaces.

### Application: General

- All insulation joints must be firmly butted. Insulation can be secured with mechanical fasteners or banded. Minimum compression is to be used to assure firm fit and still maintain thermal performance.
- Vapor retarders should overlap a minimum of 2" (51 mm) at all seams, and be sealed with appropriate pressure sensitive tape or mastic. When applying pressure sensitive tapes, the tape must be firmly rubbed with a proper sealing tool to make sure the closure is secure. Follow tape manufacturer's recommendations.
- Fasteners shall be located a maximum of 3" (76 mm) from each edge and spaced 12"–16" (305–406 mm) on center.
- Where vapor retarder performance is necessary, all penetrations and facing damage shall be repaired with tapes or mastic with a minimum of 2" (51 mm) overlap. Tapes should be applied using a sealing tool and moving pressure. Use on ducts, plenums, vessels, tanks and equipment operating at temperatures of 450° F (232° C) or less.
- Tapes and mastics (dry) should have a UL 723 rating of 25 flame spread, 50 smoke developed.

### Ducts and Plenums

- Use of 3.0 PCF (48 kg/m<sup>3</sup>) insulation board in concealed areas is recommended.
- Use of 6.0 PCF (96 kg/m<sup>3</sup>) insulation board in exposed areas and outdoor applications is recommended.

### Vessels, Tanks and Equipment

- For irregular surfaces, use 1.6 PCF (26 kg/m<sup>3</sup>) insulation board and band with minimum compression.
- For outdoor application, Earthwool Insulation Board must be covered with appropriate jacketing, mastic or other vapor retarder. All exposed surfaces must be protected.
- Apply jacketing, mastics and other vapor retarders in accordance with manufacturer's instructions.

### Precaution

- During initial heat-up to operating temperatures above 350° F (177° C), a slight odor and some smoke may be given off as a portion of the bonding material used in the insulation begins to undergo a controlled decomposition.
- If natural convection is not adequate in confined areas, forced ventilation should be provided in order to protect against any harmful fumes and vapors that might be generated.

## PACKAGING

Vacuum packaging this product will reduce some mechanical properties of the insulation. By ordering vacuum packaged products, the customer acknowledges these reduced properties and assumes responsibility for the fitness for use in their application.

## FIBERGLASS AND MOLD

Fiberglass insulation will not sustain mold growth. However, mold can grow on almost any material when it becomes wet and contaminated. Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold it must be discarded. If the material is wet but shows no evidence of mold, it should be dried rapidly and thoroughly. If it shows signs of facing degradation from wetting, it should be replaced.

Check with your Knauf Insulation Territory Manager to ensure information is current.

The chemical and physical properties of this product represent average values determined in accordance with accepted test methods. The data is subject to normal manufacturing variations. The data is supplied as a technical service and is subject to change without notice. References to numerical flame spread ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

This product is covered by one or more U.S. and/or other patents.

See patent [www.knaufnorthamerica.com/patents](http://www.knaufnorthamerica.com/patents)

Visit [knaufnorthamerica.com](http://knaufnorthamerica.com) to learn more.

**KNAUF INSULATION, INC.**

One Knauf Drive  
Shelbyville, IN 46176

**Technical Support**

(317) 398-4434 ext. 8727

[info.us@knaufinsulation.com](mailto:info.us@knaufinsulation.com)

07-21

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## Insulation Limited Warranty

- Where painting is necessary, use common water, oil, or solvent-based paints. All paints should be tested for compatibility and adhesion before use.
- All piping should have continuous insulation.
- Position longitudinal lap downward to avoid dirt and moisture infiltration.
- Do not expose pipe insulation to excessive vibration or physical abuse.
- Faced insulation should not have a facing temperature above 150° F (66° C).

## SSL+ Installation Instructions:

- To install SSL+, first remove the kraft release liner to expose adhesive.
- Carefully align the jacketing. Starting in the center of the insulation section, begin initial SSL+ tack using pressure in the direction of the overlap. Again, starting in the center of the insulation section, with a plastic squeegee begin to apply firm pressure to the bonded lap area swiping from the center of the insulation section toward each end.
- **Note:** After initial SSL+ adhesive tack, it is critical that the closure is not re-opened and repositioned on the facing. Doing so will delaminate the jacket and adhesive, diminishing the bond strength.

## Butt Strip Installation Instructions:

- To install Butt Strips, remove the kraft release liner by

separating the butt strip from the kraft using the convenient, easy release kiss cut.

- Simply wrap the butt strip, centered around the joint, and apply firm pressure with a squeegee.
- **Note:** After initial Butt Strip adhesive tack, it is critical that the closure is not re-opened and repositioned on the facing. Doing so will weaken the adhesive and diminish bond strength.

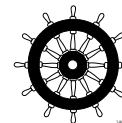
## Recommended Thicknesses (ASHRAE 90.1-2016)

The minimum thicknesses are based on ASHRAE 90.1-2016 standards and do not necessarily represent the Economic Thickness of Insulation or the thickness required for proper condensation control. Rather, they serve as minimum recommendations for commercial applications. For recommended Economic Thickness, install according to Knauf Insulation or NAIMA 3E Plus programs or as specified.

## FIBERGLASS AND MOLD

Fiberglass insulation will not sustain mold growth. However, mold can grow on almost any material when it becomes wet and contaminated. Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold it must be discarded. If the material is wet but shows no evidence of mold, it should be dried rapidly and thoroughly. If it shows signs of facing degradation from wetting, it should be replaced.

## CERTIFICATIONS



Check with your Knauf Insulation Territory Manager to ensure information is current.

The chemical and physical properties of this product represent average values determined in accordance with accepted test methods. The data is subject to normal manufacturing variations. The data is supplied as a technical service and is subject to change without notice. References to numerical flame spread ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

This product is covered by one or more U.S. and/or other patents.  
See patent [www.knaufnorthamerica.com/patents](http://www.knaufnorthamerica.com/patents)

Visit [knaufnorthamerica.com](http://knaufnorthamerica.com) to learn more.

## KNAUF INSULATION, INC.

One Knauf Drive  
Shelbyville, IN 46176

## Technical Support

(317) 398-4434 ext. 8727  
[info.us@knaufinsulation.com](mailto:info.us@knaufinsulation.com)



## DESCRIPTION

The Proto Fitting Cover System consists of one or two piece pre-molded high impact, UV resistant, LoSmoke® PVC fitting covers with or without formaldehyde free fiberglass inserts and accessories. This product line is designed to cover all standard and specialty fittings; which include elbows, tee/valves, end caps, mechanical line couplings, and many more. When combined with our PVC jacketing and solvent welding adhesive or tape, our PVC fitting covers form a completely sealed system that may be used for below ambient applications. Colored PVC is manufactured from a LoSmoke® formula that is suitable for indoor use only.

## AVAILABLE FORMS

**Thickness:** Standard and Heavy Duty

**Fitting Covers:** 45° and 90° small and long radius, tees, valves, flanges, reducers, end caps, traps, mechanical groove - fittings and many more

**Jacketing:** PVC rolls and cut and curl are available in thickness ranging from 10 to 40 mil at a 35 1/2" and 48" width

## OPERATING TEMPERATURE

**PVC:** -20° F (-29° C) to 150° F (66° C)

(exposed surface)

**Inserts:** - 20° F (-29° C) to 1000° F (538° C)

## PHYSICAL PROPERTIES

Specific Gravity (ASTMD-792)	1.41	
Tensile Modulus, PSI (ASTMD-638)	361,000 (25,380kg/cm2)	
Tensile Strength, PSI (ASTMD-638)	6,011	
Flexural Strength, PSI (ASTMD-790)	9,396	
IZOD Impact (1/4") ft. lb./in(ASTMD-256)	3.7	
Heat Deflection Temp. (ASTMD-648) @ 264 PSI (8.95 kg/cm2)	157° F (70° C)	
VICAT Softening Temp. (ASTMD-1525)	198° F (92° C)	
Permeance (WVTR)	0.015" thick	≤0.058
ASTM E E96	0.020" thick	≤0.047
Procedure A Perm, (grains/hr-ft2in Hg)	0.030" thick	≤0.027
Tested over code compliant Vapor barrier*	0.02" thick	≤0.02
*ASTM C1136@ ≤ 0.02 perm		
ASTM E 84 and CAN/ULC S102	Flame	≤25
Surface Burning Characteristics	Smoke	≤50
Puncture Resistance (ASTMD781)	0.006" thick	178 Beach Units
	0.015" thick	221 Beach Units
Electrical resistance	Non-conductor	

## SPECIFICATION COMPLIANCE

ASTM E84	Surface burning characteristics
ASTM E136	Non-combustibility (insert only)
ASTM C585	Standard dimensions for pipe
ASTM D1784	Specification for rigid PVC
ASTM C1338	Fungi test
ASTM G21 & G22	Fungi and bacteria test
Federal Specification	
LP-1035A	Federal standard PVC - Type II Grade GU
LP-535E	US Army standard PVC - Type II Grade GU
USDA	United States Department of Agriculture
New York City MEA	Toxicity
Canada	
CAN/CGSB – 51.53.95	PVC Jacketing
CAN/ULC S102	Surface burning characteristics
Agriculture Canada	
ICC	International code council
IBC	International building code
IMC	International mechanical code

## GREEN BUILDING ATTRIBUTES

Manufacturing Location	Clearwater, FL
Recycled Content	Pre 55+%
CA 1350 - VOC	Pass office and School
Berkeley Analytical	Cert NO 160504 – 10
LEED Credits per V4	Contributes EA, MR, EQ (See Proto LEED credit guide)
RoHS	Heavy metal compliant
DecaBDE ≤0.01%	Pass State of Oregon
Rigid PVC	No plasticizers or phthalates

INSERTS

Formaldehyde free preformed fiber glass inserts which are cut to a specific size and shape save time and labor and are an integral part of our LoSmoke PVC fitting system. This 1000° F rated, 1 pcf dense, insulation classified as noncombustible, meets all fungi and corrosion resistance criteria and design requirements of ASHRAE 90.1-10. The product is designed to be installed using one insert per each inch of installed pipe insulation thickness.

Specification compliance:

ASTM C553, ASTM C547, C665, C1338, C1617, C795, ASTM E84, ASTM E136  
ASHRAE 90.1  
ASTM E84 & CAN ULC S102  
**GREENGUARD:** Gold  
**Recycled content:** 53% pre and post consumer content  
**Decabrom free**

INSERT COMPRESSED THERMAL CONDUCTIVITY

Mean Temperature		K value	
F°	C°	BTU in/sq ft hr F	W/M C
75	24	0.23	0.033
150	66	0.27	0.039
300	40	0.4	0.058

APPLICATION FOR USE

Storage:

Protect cartons from water damage or other abuse. Proto cartons are not designed for outside storage.

Preparation:

Proto fitting covers and inserts should be applied on a clean, dry surface.

Above ambient – General installation:

A Proto fiberglass insert shall be wrapped completely around the metal fitting leaving no voids or open spaces. A loose wrapping of twine or tape may be helpful to hold insulation in place. The Proto Fitting Cover shall then be applied over the insert, and secured by using serrated stainless steel tacks or by taping.

Cold pipe:

Fitting systems below ambient temperature must have a continuous vapor retarder or vapor retardant mastic as specified by the engineer. When using Proto PVC Tape, a 2" (51mm) minimum downward overlap is recommended for optimum performance. Care should be taken not to stretch the last 2" (51mm) of Proto PVC Tape, to avoid stretching or creeping.

Hot system:

Use proper insulation thickness to ensure PVC covers are kept below 150°F (66°C). PVC jackets and fitting covers should be kept away from direct contact or exposure to radiated heat. For conditions where operating temperatures exceed 250°F (121°C) or where pipe insulation thickness is greater than 1" (25.4mm), two or more layers of insulation inserts are required beneath the fitting cover.

Refrigerant Systems and/or Cold Systems In Severe Ambient Conditions:

An intermediate layer of low perm facing or vapor-compatible mastic with PVC is required to completely seal the insulation prior to installing the PVC fitting cover. Vapor barrier mastic should be applied between the pipe insulation and the insert, fitting cover, throat of the fitting cover, and overlap seam.

Totally Sealed Systems (USDA):

20 mil (0.5 mm) minimum LoSmoke PVC jacketing should be applied to pipe insulation in conjunction with LoSmoke PVC fitting covers. Circumferential and longitudinal jacketing and fitting cover seams should be sealed with solvent welding adhesive. Circumferential seams should be a minimum of 1 ½" - 2" (38mm to 51mm) overlap and longitudinal seams should be 1½" - 2" (38mm to 51mm) overlap (with 6-8 inches for expansion joints). All seams should visually be checked for seal and, if necessary, repaired. Slip joints will be required between fixed supports and on continuous long runs of straight piping.

Outdoors (for white only):

Proto PVC Jacketing thickness for outdoor applications should be a minimum of 0.030" (0.8 mm) and 0.040"(1.0 mm) for any O.D. over 15". The PVC Jacketing shall be overlapped a minimum of 2" (51 mm) on the down side so as to shed water. All longitudinal and circumferential joints shall be completely weather sealed with caulk adhesive. Additionally, a slip type expansion joint of 8" (202 mm) minimum width shall be applied at least every 25 lineal feet (6.1 lineal meters) and between fittings.

The physical and chemical properties of Proto Corp. PVC represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Numerical flame spread rating is not intended to reflect hazards presented by this or any other materials under actual fire conditions. Check with Proto Corp. office to assure current information. Purchaser will be responsible to determine suitability of this product for purchaser's use. Proto Corp. liability will be limited to the purchase price of the material. No person is authorized to alter this without a Proto Corp. officer's written approval.

10500 47th Street North, Clearwater, FL 33762-5017

Toll Free: (800) 875-7768 | Office (727) 573-4665 | Fax: (727) 572-6823 | [www.Protocorporation.com](http://www.Protocorporation.com)

## FEATURES

Zeston 2000® series white PVC is intended for the protection of insulated or bare pipes. The system has long-lasting protection, an attractive finished appearance, and easy installation. It meets most requirements for federal, state and local fire-safety codes and is accepted for commercial, institutional, industrial, and residential projects in all parts of the US. Zeston 2000 Series fittings are also available with Hi-Lo Temp fiber glass inserts.

## APPLICATIONS

Commercial, institutional and industrial applications

## CONSTRUCTION

Zeston 2000 Series is manufactured from high-impact, gloss white, UV-resistant polyvinyl chloride jacketing.

## APPLICATION RECOMMENDATIONS

- Wrap the Hi-Lo Temp fiber glass insert completely around the pipe fitting without overly compressing it or leaving any voids
- Ensure that the insulation insert covers all exposed surfaces
- Install the Zeston PVC fitting cover over the pipe fitting and fiber glass insert by securing the throat of the Zeston PVC insert using either serrated tacks, Perma-Weld adhesive or Zeston Z-Tape
- If applied in an outdoor setting or exposed to the sun, precautions should be taken to account for expansion joints

## QUALIFICATIONS FOR USE

### Hot Systems

- Use proper insulation thickness to ensure PVC covers are kept below 150°F (66°C)
- PVC covers should be kept away from contact with and/or exposure to sources of direct or radiated heat
- For fittings where operating temperatures exceed 250°F (121°C) or where pipe insulation thickness is greater than 1½" (38mm), two or more layers of Hi-Lo Temp insulation inserts are required beneath the fitting cover (refer to MECH-261 Zeston Hi-Lo Temp Inserts)

### Cold Systems

- An approved vapor-barrier compatible with PVC must be applied between pipe insulation and fitting cover and on fitting cover throat overlap. Please refer to Insulspec MECH-261 on [jm.com](http://jm.com)
- For fittings where operating temperature is below 45°F (7°C) or where the pipe insulation thickness is greater than 1½" (38mm), two or more layers of Hi-Lo Temp insulation inserts are required beneath fitting cover (refer to MECH-261 Zeston Hi-Lo Temp Inserts)



### Refrigerant Systems and Cold Systems In Severe Ambient Conditioning

- Mitered pipe insulation segments, fabricated or pre-molded insulation shapes may be used in lieu of Hi-Lo temp insulation inserts
- An intermediate vapor-barrier compatible with PVC is required to completely seal the insulation prior to installing the Zeston 2000 PVC fitting cover
- Care should be taken to ensure the vapor barrier mastic is applied between the pipe insulation and the fitting cover and on the fitting cover throat overlap seam

### Totally Sealed Systems (USDA Approval)

- 20 or 30 mil (0.5 mm or 0.8mm) Zeston PVC jacketing should be applied to pipe insulation in conjunction with Zeston fitting covers
- Circumferential and longitudinal jacket and fitting cover seams should be sealed with Zeston Perma-Weld solvent welding adhesive
- Circumferential seams should be a minimum of 1" (25mm) overlap and longitudinal seams should be 1½" - 2" (38mm to 51mm) overlap
- Upon completion, all seams should visually be checked for seal and, if necessary, touched up
- Slip joints are periodically required between fixed supports and on continuous long runs of straight piping.
- To implement a slip joint, increase the circumferential overlap to 8" to 10" (203 mm to 254 mm) and apply a flexible white caulking in the overlap area to maintain a sealed system
- Refer to Zeston installation instructions CI-35 at [www.jm.com](http://www.jm.com)

## ZESTON 2000® SERIES WHITE PVC

### INSULATED FITTING COVERS AND JACKETING

#### PERFORMANCE SPECIFICATIONS

Electrical Conductance	Non-conductor
Elongation at Yield (MD), %	3.0
Flame Spread	25 or less
Smoke Developed	50 or less
Flexural Modulus, psi (kPa)	430,000 (2,964,750)
Flexural Strength, psi (kPa)	11,000 (75,850)
	10 mil (0.3 mm) 1.3
Gardner - SPI Impact,	15 mil (0.4 mm) 1.4
in.lb/mil by Ductile Failure	20 mil (0.5 mm) 1.5
	30 mil (0.8 mm) 1.6
Specific Gravity	1.48
Tensile Modulus, psi (kPa)	425,000 (2,930,270)
Tensile Strength at Yield, psi (kPa)	6,000 (41,370)

#### SPECIFICATION COMPLIANCE

ASTM	D257 (Electrical surface resistance)
	D638 (Tensile strength)
	D790 (Flexural Strength)
	D792 (Density & specific gravity)
	D1784 (Specification for rigid PVC)
	D3679 (Specification for rigid PVC)
	E84 (Surface burning characteristics)
	E136 25/50 non-combustibility (fiber glass inserts)
Agriculture Canada	Pass (Canada Department of Agriculture)
Canada	CGSB51-GP-53M
CAN/ULC	S102
L-P*: Composition	535E (Federal standard for PVC)
A, Type II, Grade	1035A (US Army standard PVC)
GU	
New York City MEA	#7-87 (Toxicity test)
USDA	US Department of Agriculture

#### COMPRESSED THERMAL CONDUCTIVITY ZESTON HI-LO TEMP INSULATION INSERTS

Mean Temperature		"K"	
°F	°C	BTU•in/(hr•ft <sup>2</sup> •°F)	W/M•°C
75	24	0.23	0.033
150	66	0.27	0.039
300	149	0.40	0.058



717 17th St.  
Denver, CO 80202  
(800) 654-3103  
JM.com

Technical specifications as shown in this literature are intended to be used as general guidelines only. Please refer to the Safety Data Sheet and product label prior to using this product. The physical and chemical properties of the product listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Any references to numerical flame spread or smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Regional Sales Office nearest you for current information.

**All Johns Manville products are sold subject to Johns Manville's standard Terms and Conditions, which includes a Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville standard Terms and Conditions or for information on other Johns Manville thermal insulation and systems, visit [www.jm.com/terms-conditions](http://www.jm.com/terms-conditions) or call (800)654-3103.**

## DESCRIPTION

Zeston® Hi-Lo Temp fiberglass insulation inserts are flexible, pre-cut inserts for PVC pipe fittings. They are sized for each specific PVC fitting and are a lower-cost alternative to preformed or fabricated insulated elbows. The inserts are designed to meet the thermal requirements of ASTM C553 and ASHRAE 90.1.

Zeston Hi-Lo Temp Insulation Inserts are manufactured from rotary-process fiberglass bonded with a Formaldehyde-free™ resin. They are cut to size to be used in conjunction with JM's Zeston PVC fittings. Zeston Hi-Lo Temp Insulation Inserts are flexible, odorless, and vibration resistant. They can save time and labor during installation and are designed to meet corresponding pipe insulation thermal value. The Zeston Hi-Lo Temp Insulation Inserts are made with a formaldehyde-free binder; however, all bonded fibrous insulation products made with formaldehyde-free binders will result in some formaldehyde emissions at temperatures that exceed 450°F.

## USES

Zeston Hi-Lo Temp Insulation Inserts are used to insulate PVC fittings in operating temps between 0°F-850°F/-18°C-454°C. JM recommends installing one (1) Zeston Hi-Lo Temp Insulation Insert for every 1" of corresponding pipe insulation thickness. The insulation insert may emit minimal smoke and odor during the initial exposure to elevated temperatures. Keep the area well-ventilated during the initial heat-up.

## PHYSICAL PROPERTIES

- 2" thick 1.0 PCF density
- Formaldehyde-free™ binder
- Insulation is a white, light-weight, highly resilient, blanket-type thermal insulation manufactured from rotary process fiber glass
- Inserts are tabbed on sizes 2-10 and cut all the way through for large-size fitting inserts, to accommodate easy separation and resist tearing
- Service Temp. Range (ASTM C411) 0°F - 850°F/-18°C - 454°C
- Corrosivity (ASTM 1617) Pass
- Limited Combustibility <3500 BTU/LB
- Microbial Growth (ASTM C1338) Pass
- Moisture Sorption <5% by weight
- pH 7.5 - 12
- Surface Burning Characteristics (ASTM E84) ≤ 25/50 (flame/smoke)
- Uncompressed Insulation thickness/density 2" Thick/1 PCF Density



## COMPRESSED THERMAL CONDUCTIVITY

Mean Temperature		K	
°F	°C	BTU • in/(hr • ft² • °F)	W/m•°C
75	24	.23	.033
150	66	.27	.039
300	149	.40	.058

## SPECIFICATION COMPLIANCE

ASTM C553  
 ASHRAE 90.1  
 ASTM E84 25/50 rating  
 NRC 1.36, ASTM C795, MIL-DTL-24244\*

\*Before ordering material to comply with these specifications, a statement of the fact must appear on the purchase order. Specific lot testing will be conducted and a certification of compliance can be provided.

## SUSTAINABLE BUILDING ATTRIBUTES

Recycled Content: 20%







## AEROFLEX® Self-Seal™

Pre-Slit EPDM Pipe Insulation





# AEROFLEX® Self-Seal™

## Pre-Slit EPDM Pipe Insulation

HVAC | VRF | Chilled Water | Refrigeration  
Hot and Cold Water Plumbing

Closed-cell elastomeric foam pipe insulation with self-seal, dual-tape closure system. Proprietary blend of nonpolar EPDM rubber is key to consistent, long-lasting thermal performance and protection against moisture and environmental stresses.

Wide range of sizes and thicknesses to meet energy code and condensation control requirements. See back cover.

Available in standard AEROFLEX® and White/Gray formulas.

### Fast, simple to install

Double-closure system saves labor by eliminating need for field-applied adhesives on longitudinal seams

### ID range from 3/8" to 16" IPS

Built-in vapor retarder - No supplemental vapor barrier required for most applications\*

### Superior environmental stability

Nonpolar - does not induce or react with water

Low thermal conductivity - reduced insulation thicknesses

Greater UV resistance than NBR/PVC insulation

Non-corrosive on stainless steel & copper piping

Suitable for interior & exterior applications\*\*

### Safe for indoor environments

Superior fire safety - 25/50 rated (ASTM E84, UL723, CAN/ULC-S102) and self-extinguishing (ASTM D635) thru 2-inch thick

Indoor Advantage™ Gold Certified for low chemical emissions

Verified Environmental Product Declarations (EPD's) and Health Product Declarations (HPD's)

No CFCs, HFCs, HCFCs, PBDEs, formaldehyde, nitrosamine or fibers

Naturally mold-resistant: no biocides required

Ultra-low PVC content - less than 1%



### Cel-Link II®

Patented "peel and seal" glueless seam seals for fast and reliable adhesion of AEROFLEX® pipe insulation.

\*\*\*Protape® zero-perm EPDM rubber tape required over Cel-Link II® seams.

## AEROFLEX® EPDM insulation system solutions



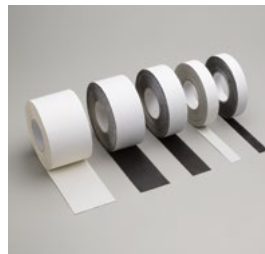
### Aerofix®

Light-weight, rigid pipe supports, pre-insulated with high-density, load-bearing closed-cell foam and encased with zero-perm EPDM polymer membrane. Includes built-in pressure sensitive Protape® closure system.



### AeroFit™

Pre-fabricated fitting covers made of AEROFLEX® EPDM rubber for a high-quality installation on HVAC and plumbing piping.



### Protape®

Zero-perm EPDM-based, self-adhering rubber tape for sealing glued insulation seams and termination points.



### AEROFLEX® Adhesives

Specially formulated adhesives for bonding and vapor-sealing AEROFLEX® EPDM insulation. Fast tack and LVOC formulations available.

\*Supplemental vapor barrier may be required in extreme low-temperature or high-humidity applications. Protective jacket required for direct-bury applications and if insulation may be subjected to mechanical damage.

\*\*Note: National, state & local energy codes require protection of cellular foam pipe insulation from solar radiation for exterior applications. Jackets and insulation coatings are acceptable. Adhesive tapes are not permitted.

**Product:** Closed-cell EPDM (Ethylene Propylene Diene Monomer)-based rubber elastomeric foam pipe insulation for HVAC (VRF, chilled water & refrigeration) and plumbing piping.

**Standard Specification:** ASTM C534 Type I Grade 1

**Installation  
Instructions:**



**Thermal Conductivity (K) Btu-in/hr-Ft² -°F (W/m.K)**

Mean Temperature	K Value	Test Method
50°F (10°C)	0.237 (0.0342)	ASTM C177/C518
75°F (24°C)	0.245 (0.0353)	
100°F (38°C)	0.252 (0.0363)	
125°F (52°C)	0.260 (0.0375)	
150°F (66°C)	0.267 (0.0385)	
200°F (93°C)	0.282 (0.0406)	
250°F (121°C)	0.315 (0.0454)	

**Physical and Operational Properties**

Property	Test Value/Rating	Test Method
Service Temperature, CONTINUOUS	-297°F to 257°F -183°C to 125°C	ASTM C411¹
UV Resistance	Minimal cracking or color change	ASTM G7
Ozone Resistance	No cracking	ASTM D1171
Water Vapor Permeability, Max	<b>0.02 perm-inch</b> (4.38 x 10 <sup>-11</sup> g/Pa.s.m)	ASTM E96
Water Absorption (% by Volume), Max	0.2%	ASTM C209/C1763
Surface Burning/Flammability (through 2" thick)	Pass	UL94 V-0
	25/50	ASTM E84, UL723, CAN/ULC-S102
	Pass	NFPA 90A/90B
	Self-extinguishing	ASTM D635
VOC Emissions	< 0.5 mg/m3	CDPH Standard Method v1.2
Corrosion of Stainless Steel	Non-corrosive	ASTM C692, DIN 1988
Fungi Resistance	No Growth	ASTM C1338/G21
Mold Resistance	No Growth	UL181 Section 13
Linear Shrinkage	< 7.0%	ASTM C534
Air Erosion	Pass	UL181 Section 18
Shelf Life	2 years (date of manufacture)	

¹ AEROFLEX® EPDM flexibility begins to decrease at -70°F and below. This does not impact the insulating properties of the material.

**Additional Approvals, Certifications & Compliance**

ASTM D1056, 2C1	Standard Specification for Flexible Cellular Materials–Sponge or Expanded Rubber
ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1	International Green Construction Code® (igCC®)
ANSI/ASHRAE/IES Standard 90.1	Energy Standard for Buildings Except Low-Rise Residential Buildings
Buy American	Buy American, Federal Acquisition Regulation, FAR 52.225 Buy American
CA Title 24	California Building Energy Efficiency Standards
California Specification 01350	VOC Emissions, Standard Method v1.2
EPA TSCA Section 6(h)	Toxic Substances Control Act Persistent, Bioaccumulative, and Toxic (PBT) Chemicals
IECC®	International Energy Conservation Code®
LEED®	U.S. Green Building Council - Leadership in Energy and Environmental Design
MEA #171-04-M	City of New York Material and Acceptance Pipe Insulation
REACH	European Chemicals Agency (ECHA) - Registration, Evaluation, Authorization and Restriction of Chemicals
RoHS	European Union - Restriction of Hazardous Substances

**Potential LEED® Credit Contributions**

Energy & Atmosphere (EA)	Prerequisite: Minimum Energy Performance Credit: Optimize Energy Performance
Materials & Resources (MR)	Credit: Building Product Disclosure and Optimization - Environmental Product Declarations (EPD), Product Specific Type III Credit: Building Product Disclosure and Optimization - Material Ingredients, verified HPD
Indoor Environmental Quality (EQ)	Credit: Low-Emitting Materials Credit: Indoor Air Quality Assessment Credit: Thermal Comfort Credit: Acoustic Performance
Innovation (IN)	Credit: Occupant Comfort Survey

