SUBMITTAL REVIEW

CLIENT NAME: Vails Gate Fire Department

PROJECT TITLE: Vails Gate FD - New Firehouse

SUBMITTAL No.: 220719-1 **H2M PROJECT No.:** VGFD2001

SUBMITTAL NAME: Plumbing Piping Insulation- PD

SUBMITTAL REVIEW

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

- [x] NO EXCEPTIONS TAKEN
- [ ] SUBMIT SPECIFIED ITEM
- [ ] MAKE CORRECTIONS NOTED (RESUBMISSION NOT REQUIRED)
- [ ] NO ACTION TAKEN (REVIEW IS THE RESPONSIBILITY OF ANOTHER PARTY)
- [ ] REVISE & RESUBMIT
- [ ] NO ACTION TAKEN (THIS SUBMITTAL IS NOT REQUIRED BY THE CONTRACT)
- [ ] REJECTED - SEE REMARKS
- [ ] 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: 04/07/2023 By: KJE

Rev.: 2020-05-20

Comments:

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:	Plumbing Piping Insulation Product Data		
Submission Date:	04/03/2023	Submission Log No.:	220719-1
Specification Section:	220719	Paragraph Reference:	1.04.B
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:		☑ No	☐ Yes
KEY CONSTRUCTION SERVICES, LLC **Project No: VGFD2001** 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. **SUBJECT TO ARCHITECT AND OR ENGINEER APPROVAL** **Signed** *Joseph Manfredi*(PM) **Date: 4/3/2023** Contractor's Approval Stamp with Signature & Date		Contractor's Brief Comments or Remarks (attach separate letter as needed): 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.	

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*

LETTER OF TRANSMITTAL

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

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

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

EMAIL	DATE	NO.	DESCRIPTION
1	4-3-23	220719	PLUMBING 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	Domestic Cold Water	Interior	All	1"	Fiberglass Pipe Covering	Self Seal	ASJ	SSL	Fiberglass insert	PVC	
2	Domestic Hot Water	Interior	<= 1-1/4" >= 1-1/2"	1" 1-1/2"	Fiberglass Pipe Covering	Self Seal	ASJ	SSL	Fiberglass insert	PVC	
3	Horizontal Storm	Interior	All	1"	Fiberglass Pipe Covering	Self Seal	ASJ	SSL	Fiberglass insert	PVC	

PRODUCT DATA			
PRODUCT	MANUFACTURER	PRODUCT	MANUFACTURER
Fiberglass Pipe Covering	Johns Manville, Knauf		
PVC Covers	Proto, Johns Manville		

REVISION			
DATE			
JOB	Vails Gate FD – Plbg.		
LOCATION	Annex New Fire Station		
CUSTOMER	Joe Lombardo Plbg. & Htg.		

Atlantic Contracting & Specialties, LLC
102 New South Road
Hicksville, NY 11801

Phone: 516-261-9919

Fax: 516-261-9925

Contract #13200201

Submittal

Date 3/14/23

By Tim Hartnett

Johns Manville
A Berkshire Hathaway Company

MECHANICAL INSULATION

MICRO-LOK® *HP*

HIGH-PERFORMANCE FIBERGLASS PIPE INSULATION

DATA SHEET

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
Jacketing	ASTM C1136 (Type I & II)
Water Vapor Permeance (ASTM E96 – Procedure A)	0.02 perms max.
Burst Strength (ASTM D774)	55 lbs/in^2 (4.6 Kg/cm^2)
Tensile Strength (ASTM D828)	45 lbs./in. (7.9N/mm) width min. (MD) 30 lbs./in. (5.23N/mm) width min. (CD)

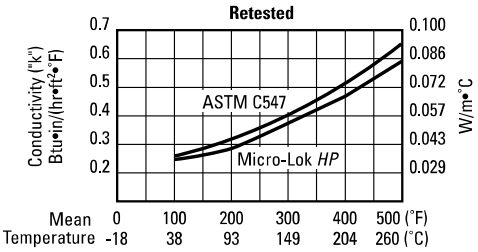
SPECIFICATION COMPLIANCE

- 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 ½ [22 mm x 13 mm], ½ x ½ [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") *



Mean	°F	75	100	200	300	400	500
Temperature	°C	24	38	93	149	204	260
Btu•in/(hr•ft²•°F)		0.23	0.24	0.28	0.34	0.44	0.55
W/m•°C		0.034	0.035	0.040	0.049	0.063	0.079

* 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	

GREENGUARD
PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS
ULCOM/GG
UL 2818
GOLD

CERTIFIED RECYCLED CONTENT
SCS GLOBAL SERVICES
AVERAGE 28% RECYCLED CONTENT
POST-CONSUMER

C ETV US LISTED
Intertek

CLASSIFIED UL
Insulated Plastic Pipe Assemblies (BSMP)

MICRO-LOK® *HP*

HIGH-PERFORMANCE FIBERGLASS PIPE INSULATION

DATA SHEET

SIZE AVAILABILITY

Insulation Thickness		Iron Pipe Size Range		Copper Tubing Size Range	
in.	mm	in.	mm	in.	mm
½	13	½–6	13–152	⅝–4⅛[§]	16–105
1	25	½–24	13–610	⅝–6⅛	16–156
1½	38	½–24	13–610	⅝–6⅛	16–156
2	51	½–24	13–610	1⅛–6⅛	29–156
2½	64	1–24	25–610	1⅜–6⅛	35–156
3	76	1–24	25–610	1⅜–6⅛	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.*

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

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

MECH-228 08/30/21 (Replaces 06/16/21)

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.

CONTRACTOR: _____

JOB: _____

DATE: _____

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)

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.

with ECOSE® TECHNOLOGY

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

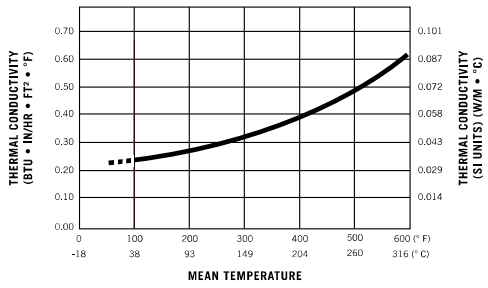
- Produced in 3' (914 mm) sections
- For iron pipe ½" – 24" (15 mm – 610 mm) nominal pipe size
- For copper tube ⅝" – 6⅛" (16 mm – 156 mm)
- All insulation inner and outer diameters comply with ASTM C585.
- Wall thicknesses from ½" to 6" (13 mm to 152 mm) in single layer for most sizes
- With or without 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"
Heating and Hot Water Systems (Steam, Steam Condensate, Hot-Water Heating and Domestic Water Systems) [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"
Cooling Systems (Chilled Water, Brine, Refrigerant) [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^3) insulation board in concealed areas is recommended.
- Use of 6.0 PCF (96 kg/m^3) insulation board in exposed areas and outdoor applications is recommended.

Vessels, Tanks and Equipment

- For irregular surfaces, use 1.6 PCF (26 kg/m^3) 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

Visit **knaufnorthamerica.com** to learn more.

KNAUF INSULATION, INC.
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Shelbyville, IN 46176

Technical Support
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info.us@knaufinsulation.com

07-21

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.
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01-21

Proto corp.
Engineered Thermoplastics

LoSmoke® PVC Jacketing and Fittings
Submittal Sheet

protocorporation.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.

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ZESTON 2000® SERIES WHITE PVC
INSULATED FITTING COVERS AND JACKETING

DATA SHEET

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
- 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 ans 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

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)	11,0000 (75,850)
Gardner - SPI Impact, in.lb/mil by Ductile Failure	10 mil (0.3 mm) 1.3 15 mil (0.4 mm) 1.4 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 GU	1035A (US Army standard PVC)
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•ft2•°F)	W/M•°C
75	24	0.23	0.033
150	66	0.27	0.039
300	149	0.40	0.058

Johns Manville

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JM.com

MECHANICAL INSULATION

ZESTON® HI-LO TEMP INSULATION INSERTS

FIBERGLASS INSULATION INSERTS

DATA SHEET

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 oder. Specific lot testing will be conducted and a certification of compliance can be provided.

SUSTAINABLE BUILDING ATTRIBUTES

Recycled Content: 20%

GREENGUARD
PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS
ULCOM/GG
UL 2818
GOLD

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