SECTION 23 07 19

HVAC PIPING INSULATION

PART 1: GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 SUBMITTALS

A. Submit the following product data:

1. Provide product description, list of materials “k” Value, “R” Value, mean temperature rating, thickness for each service and locations.

2. Manufacturer’s installation instructions. Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.3 LESSONS LEARNED AND DESIGN CONSIDERATIONS

A. Fire test response characteristics: Insulation and related materials shall have fire tested response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspection agency acceptable to UTA. Factory label insulation and jacket materials and adhesive, mastic, tapes with appropriate markings of applicable testing and inspecting agency.

1. Insulation installed indoors: Flame spread index of 25 or less, and smoke developed index of 50 or less.

2. Insulation installed outdoors: Flame spread index of 75 or less, and smoke developed index of 150 or less.

B. Insulation shall be kept dry and clean during storage and installation. Insulation that becomes wet, whether installed or stored shall be discarded.

C. Continue insulation through walls, sleeves, pipe hangers and other pipe penetrations.

D. Piping conveying fluids less than 140 degrees F and above ambient temperatures, do not insulate flanges and unions at equipment. Bevel and seal ends of insulation.

E. Piping conveying fluids over 140 degrees F, insulate flanges and unions including those at equipment. Label insulation to indicate a concealed flange or union.

F. Apply corrosion resistant coating to carbon steel piping prior to installing insulation.

G. Manufacturer’s installation instructions shall be followed. Where the requirements of the specification are in conflict with the installation instructions, the contractor will bring the issue to the attention to the appropriate design professional.

H. Coordinate with trade installing heat tracing if applicable.

I. Do not weld brackets, clips or other attachment devices to piping, fittings or specialties.

J. Install insulation with the least amount of joints possible.

K. Seal joints, seams and penetrations with a vapor barrier mastic at manufacturers required thickness and coverage rate.

L. Self-sealing lap and butt joints will not be acceptable as the only seal on pipe insulation joints. Self- sealing lap and butt joints may be used only of additionally secured with field applied mastic.

M. Insulation thickness shall be specified to eliminate condensation on outside of jacket and a maximum surface temperature of 140 degrees F.

N. Insulated piping at or below 8'-0" above the finished floor will be encased in a protective jacket. All exposed outdoor piping shall have metal jacket.

O. All the piping of a system requiring insulation will be insulated and made clear on the drawings. Piping routed through cavities, cabinets, chases etc. will be insulated.

PART 2 - PRODUCTS

2.1 GENERAL

A. This product section is intended to inform the PSP on the minimum standard of quality that should be incorporated in new designs. The PSP should evaluate these standards and incorporate or make additional requirements per project specific requirements. Where the PSP considers any requirement listed not to be applicable or incompatible with the project design intent should be discussed with UTA Office of Facilities Management.

2.2 STEAM PIPING INSULATION

A. **Steam piping shall be insulated with Manville's Thermo-12 or Owens/Corning Kaylo calcium silicate insulation with a factory applied aluminum cover 0.016 inches thick.** Joints will be sealed with aluminum snap straps provided fastened in place with 0.75 inch wide x 0.020 inches thick stainless steel bands.

B. Pipe insulation shall be firmly wired in place by the use of no less than six loops of No. 16 annealed copper clad iron wire per three foot section of insulation.

C. Heat transfer packaged steam systems will be insulated the same as specified in the project.

D. All cracks and voids in the insulation shall be filled with Manville's Cement No. 301 so that the resulting surface is smooth and continuous.

2.3 STEAM CONDENATE RETURN PIPING INSULATION

A. Preformed fiberglass insulation with all service factory applied jacket, vapor sealing all joints and preformed fittings with vapor seal. Place fiberglass insulation in voids around valves and fittings.

B. Steam condensate return flanges, valves, strainers etc. shall be covered with removable insulation jacket.

C. Manufacturers: Owens Corning, Johns Manville

2.4 BUILDING CHILLED WATER PIPING INSULATION

A. "FOAMGLASS" as manufactured by the Pittsburgh Corning Corporation or "INSUL-PHEN" as manufactured by Resolco, Inc.

B. Any voids in the completed installation of the insulation shall not be filled with vapor seal coating but shall be eliminated by refitting or replacing insulation.

C. Insulation on flanges, valves and other fittings shall consist of prefabricated fitting covers of the same thickness as specified for adjoining pipe insulation.

D. All insulation joints (longitudinal and butt) shall be brushed with vapor sealant mastic then pressed firmly together. The joint sealer shall be between the joints as well as over the joints.

E. Longitudinal joint splits in insulation shall be within 45 degrees of horizontal.

2.5 CONDENSATE DRAIN PIPING INSULATION

A. Condensate drain piping from chilled water coils and any other condensate piping will be insulated with closed cell elastomeric insulation.

B. Elastomeric products shall be supplied in a pre-slit tubular form with pressure sensitive adhesive system for vapor sealing the longitudinal joint.

C. Manufacturers: Armacell, Aerocell, 3M

2.6 HEATING HOT WATER PIPING

A. Glass fiber pipe insulation. Molded fibrous glass pipe insulation with factory applied all service jacket. Nominal density of 3.5 lb/cuft or more.

B. Manufacturers: CertainTeed Corp., John's Manville, Knauf Insulation, Owens Corning.

PART 3 - EXECUTION

3.1 An onsite meeting with the chilled water installation contractor, the engineer and UTA facilities engineer will be required before the chilled water insulation is installed.

3.2 **UTA will inspect installation of all insulation. UTA requires 48 hour notice before inspections**.

3.3 Piping surfaces shall be clean and dry prior to installing insulation. Insulation will not be applied to wet pipe.

3.4 Contractor will provide a small section of insulation to be mocked up for approval prior to installing piping insulation.

PART 4 - APPENDIX

4.1 REPRESENTITIVE PRODUCT DATA

A. Building Steam Piping Insulation

1. Thermo-12 Product Sheet

B. Steam Condensate Piping Insulation

1. Owens Fiberglas Pipe Insulation Product Sheet

C. Building Chilled Water Insulation

1. INSUL-PHEN Product Sheet

2. INSUL-PHEN Manufacturers Installation portion of the "Installation and Specification Guide".

D. Cooling Condensate Piping Insulation

1. Armacell Manufacturers Product Sheet

E. Building Heating Water Insulation

1. Owens Fiberglas Pipe Insulation Product Sheet

END OF SECTION 23 07 19

APPENDIX 4.1.A – BUILDING STEAM PIPING INSULATION PRODUCT DATA

Johns Manville
Industrial Insulation Group

Thermo-12® Gold
Pipe and Block Insulation

PRODUCT DATA SHEET

Thermo-12® Gold

Thermo-12 Gold is a preformed, high-temperature, abuse-resistant pipe and block insulation with exceptional structural strength, composed of hydrous calcium silicate for use on systems operating up to 1200°F(650°C). It is inorganic, non-combustible, Asbestos Free and meets or exceeds the physical and thermal property requirements of ASTM C533, Type 1. Integral to Thermo-12 Gold is, XOX Corrosion Inhibitor a distinctive formula and process that inhibits corrosion to outside surfaces of pipe and equipment.

THE ADVANTAGES

- Excellent resistance to damage enhancing the life of the system.
- Inhibits corrosion on carbon steel and stainless steel piping and equipment.
- Consistent thermal performance to 1200°F(650°C).
- Non-Combustible Insulation.
- Structural strength protects against damage to lagging.
- Asbestos, Mercury and Lead Free.
- No organic binders; No loss of insulation integrity due to binder burn out.
- Large selection of sizes and forms.

APPLICATIONS

Thermo-12 Gold is the product of choice for high-temperature pipe and equipment due to it's high strength and durability, low thermal conductivity and corrosion inhibiting performance. Thermo-12 Gold is especially recommended for use in the petrochemical, power generation and process industries where piping and equipment operating up to 1200°F (650°C). The XOX Corrosion Inhibitor corrosion inhibiting properties are not diminished by temperature cycling so the corrosion protection will continue for the life of the product. Thermo-12 Gold will not burn and may be used as a component in fire protection systems in the some applications. Please visit our website at www.jm.com/industrial for specific application information.

FIRE SAFETY

Surface Burning Characteristics. When tested in accordance with ASTM E84, NFPA 255, and UL 723, Thermo-12 Gold has flame spread/smoke developed ratings of 0/0.

Non-Combustible. When tested in accordance with ASTM E136 as defined by NFPA 255 and NFPA 101.

ADDITIONAL INFORMATION AND SDS

Please visit our website at www.jm.com/industrial

CUSTOMER SERVICE, TECHNICAL & GENERAL INFORMATION (800) 866-3234

IND-300 12-16 (Replaces IND-300 01-16

THERMO-12® GOLD
OPERATING TEMPERATURE LIMIT: 1200°F (650°C)

AVAILABLE FORMS AND SIZES

Pipe Sizes		Thermo-12 Gold
in.	mm	
½-24	15-600	Pipe Insulation
20-37	500-925	Quad Segments
38-52	950-1300	Hex Pipe Covering (Ruston Plant Only)
30 min	750 min	3-V Scored Block Width - 12" (305 mm) Length - 36" (914 mm)
Flat Surfaces		Flat Block Width - 6" and 12"(152 mm and 305 mm) Length - 36" (914 mm)

Thermo-12 Gold pipe insulation is 36" (914 mm) in length, and is available in thicknesses from 1" to 6" (25 mm to 150 mm) in ½" (15 mm) increments. Thick wall material is furnished in double layers.

Thermo-12 Gold flat block insulation is 12" (305 mm) wide and 36" (914 mm) in length, and is available in thicknesses from 1" to 4" (25 mm to 100 mm) in ½" (15 mm) increments. Non-standard widths of 18" and 24" (457 mm and 610 mm) are available on a made-to-order basis. Inquire for price and availability.

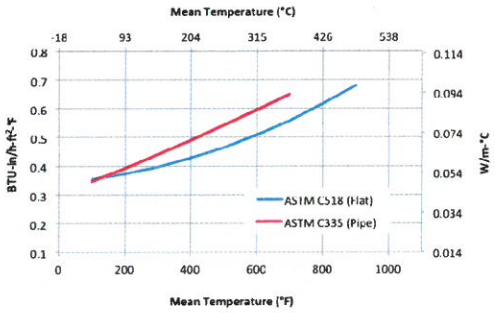
3-V SCORED BLOCK APPLICATION GUIDE

Minimum Diameter			
Insulation Thickness		Triple Scored	
in.	mm	in.	mm
1½	38	30	762
2	51	40	1016
2½	64	50	1270
3	76	60	1524
3½	89	70	1778
4	102	80	2032

Johns Manville
Industrial Insulation Group

Thermo-12® Gold
Pipe and Block Insulation

THERMAL CONDUCTIVITY



	Mean Temperature	°F	100	200	300	400	500	600	700
		°C	38	93	149	204	260	316	371
ASTM C335 (Pipe)	Btu • in/(hr • ft² • °F)		.344	.389	.437	.486	.538	.591	.647
	W/m • °C		.050	.056	.063	.070	.078	.085	.093
ASTM C518 (Flat)	Btu • in/(hr • ft² • °F)		.355	.373	.397	.428	.465	.509	.559
	W/m • °C		.051	.054	.057	.062	.067	.073	.081

* Thermo-12 Gold Insulation is tested in accordance with ASTM C518 and ASTM C335.

PRODUCT CERTIFICATION

When ordering material to comply with any government specification or any other listed specification, a statement of that fact must appear on the purchase order. Government regulations and other listed specifications require specific lot testing, and prohibit the certification of compliance after shipment has been made. There may be additional charges associated with specification compliance testing. Please refer to IND-CSP-3 for Certification Procedures and Charges. Call customer service for more information.

ISO 9000 CERTIFICATION

Thermo-12 Gold is manufactured and tested in our own facilities under implemented Quality Management Systems which are certified to be in accordance with stringent ISO 9000 series quality standards. This certification, along with regular independent third-party auditing for compliance, is your assurance that this product delivers consistent high quality.

SPECIFICATION COMPLIANCE

ASTM C165 Compressive Strength	>100psi(690kPa) 5% compression
ASTM C203 Flexural Strength	>50psi(450kPa)
ASTM C302 Density (Dry) Average	>14pcf(230kg/m³)
ASTM C356 Linear Shrinkage	<2.0% after 24hr Soaking period at 1200°F(650°C)
ASTM C421 Abrasion Resistance Weight Loss by Tumbling	After the first 10min <20% After the second 10min<40%
ASTM C447 Maximum Service Temperature	1200°F(650°C)
ASTM C533, Type I Material Specification	Passes
ASTM C665 Corrosivity to Steel	Passes
ASTM C795/C871/C692 Corrosion: Austenitic Stainless Steel	Passes
ASTM C1338 Fungi Resistant	Passes
ASTM C1617 Corrosion	Passes-
ASTM E84 Surface Burning Characteristics	Flame Spread -0 Smoke Developed -0
ASTM E119 Building Fire Test	Passes
ASTM E136 Non-Combustible	Passes
BS 476 PART II	Passes
Can/ULC S-102 Surface Burning Characteristics	Flame Spread -0 Smoke Developed -0
NFPA 255 Surface Burning Characteristics	Flame Spread -0 Smoke Developed -0
ISO 8143 Material Specification	Passes
NRC Reg. Guide 1.36	Passes
MIL-I-24244 Military Specification	Passes
MIL-I-2781F to 1200°F(650°C) [Pipe] Military Specification	Passes
MIL-I-2819F Class 2 to 1200°F(650°C) [Block] Military Specification	Passes

Industrial Insulation Group, LLC manufactures MinWool-1200® mineral fiber pipe, block and a variety of other insulations; Thermo-12® Gold Calcium Silicate pipe and block insulation; Microporous Blanket Insulation; Super Firetemp® fireproofing board; SprouleWR-1200® Perlite pipe and block insulation; high-temperature adhesives, and insulating finishing cement. The physical and chemical properties presented 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. Numerical flame spread and smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Customer Service Office to assure current information. All Industrial Insulation Group products are sold subject to the Johns Manville Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville Limited Warranty and Limitation of Remedy, email info.industrial@jm.com.

CUSTOMER SERVICE
TECHNICAL & GENERAL INFORMATION
(800) 866-3234

Johns Manville
Industrial Insulation Group
2100 LINE STREET • BRUNSWICK, GA 31520

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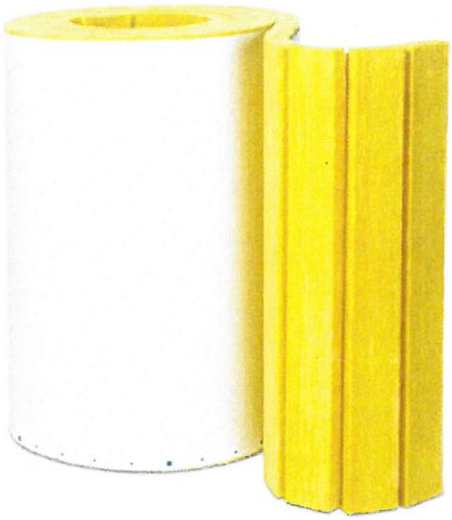
IND-300 12-16 (Replaces IND-300 01-16

APPENDIX 4.1.B – STEAM CONDENSATE PIPING INSULATION PRODUCT DATA

Fiberglas™ Pipe & Tank Insulation

Fiberglas™ Pipe and Tank Insulation provides a flexible insulation product for wrapping pipes, tanks, or irregularly shaped objects while providing excellent rigidity and abuse resistance.



DESCRIPTION

Owens Corning's versatile Fiberglas™ pipe and tank insulation is a semi-rigid insulation with a factory-jacketed FRK or ASJ Max encapsulated-paper jacket. It's flexible enough to be used in many different applications while providing the rigidity and thermal performance you need for a well-insulated system.

APPLICATION/USE

Fiberglas™ Pipe and Tank insulation provides thermal protection for a variety of objects and shapes. Fits pipes and equipment of 10" NPS and larger.

- Pipes
- Tanks
- Pipe flanges
- Valves
- Groups of parallel pipes
- Pipes with heat tracing lines

FEATURES & BENEFITS

- May be applied over existing insulation to increase thickness and conserve energy
- Vertical fiber orientation with a durable, high-compressive strength makes it strong and abuse resistant

ASJ Max Jacket

- Durable, cleanable poly-encapsulate paper jacket that doesn't support mold or mildew growth
- Resists/sheds water when exposed to intermittent, short-duration precipitation during construction
- Less wicking and curling than standard ASJ
- Accepts paint and mastic as well as standard ASJ
- Higher puncture resistance than standard ASJ
- Has a finished appearance that is compatible with standard ASJ

SPECIFICATIONS

Availability

Thickness		Facing	Recommended Pipe Size	Roll Length	
in.	(mm)		NPS in. (DN, mm)	ft.	(m)
1	(25)	ASJ Max	10 (250) +	42	(12.8)
1-½	(38)	ASJ Max	10 (250) +	27	(8.2)
2	(51)	ASJ Max	10 (250) +	20	(6.1)
2	(51)	FRK	10 (250) +	20	(6.1)
2-½	(64)	ASJ Max	14 (350) +	26	(7.9)
2-½	(64)	FRK	14 (350) +	26	(7.9)
3	(76)	ASJ Max	17 (425) +	21	(6.4)
3-½	(89)	ASJ Max	20 (500) +	18	(5.5)
4	(102)	ASJ Max	23 (575) +	16	(4.9)

MTO (Made to Order). Product availability subject to change. View product guide for details. All rolls are 36" wide.

Physical property data

Property	Value	Test Method
Pipe/equipment Operating Temperature (single-layer application)	0°F to 650°F (–18°C to 343°C)	ASTM C411
Insulation Jacket Temperature Limitation	–20°F to 150°F (–29°C to 66°C)	ASTM C1136
Jacket Permeance	0.02 perm	ASTM E96, Proc. A
Minimum Burst Strength	100 psi	ASTM D774/D774M
Compressive Strength at 10% Deformation	125 lb./ft² (5985 Pa) min.	ASTM C165
Surface Burning Characteristics[1]	Flame Spread: 25 Smoke Developed: 50	ASTM E84

1. The standard used to determine surface burning characteristics measures and describes the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment, which takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest 5 rating.

Installation instructions

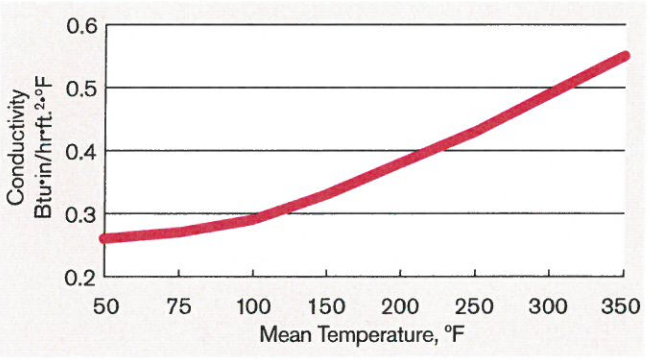
1. Measure the length of insulation required according to the fabrication guide located on the carton.
2. Cut completely through the insulation and jacket. Use a flap tool to fillet a stapling flange on one end of the insulation.
3. Each section of insulation may be secured around the pipe using either outward-clenching staples and mastic or outward-clenching staples and pressure-sensitive, vapor-retarder tape.
4. Adjacent sections must be tightly butted together and then sealed with vapor-retarder tape.

Additional installation instructions

- Special care must be taken to vapor-seal systems operating below ambient temperatures.
- If indoor applications will be painted, use only a water-based latex paint.
- Outdoor applications require protection from weather.

Thermal conductivity

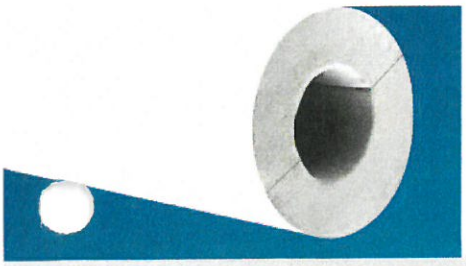
Mean Temperature °F	k*	Mean Temperature °C	λ*
50	0.26	10	0.037
75	0.27	25	0.040
100	0.29	50	0.045
150	0.33	75	0.050
200	0.38	100	0.056
250	0.43	125	0.063
300	0.49	150	0.070
350	0.55	175	0.078



* k = Btu•in/hr•ft²•°F; λ = W/m•°C

Apparent thermal conductivity data determined in accordance with ASTM Practice C1045 with data obtained by ASTM Test Method C335. Values are nominal, subject to normal testing and manufacturing tolerances.

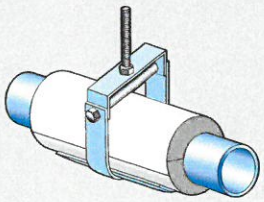
APPENDIX 4.1.C – BUILDING CHILLED WATER PIPING INSULATION PRODUCT DATA

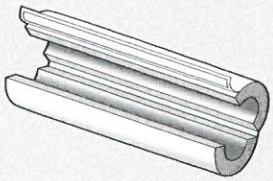


INSUL-PHEN GREEN INSULATION

Quick Specification Guide

INSUL-PHEN PHENOLIC *Insulation*





The following guidelines should be used for the specification and application of Insul-Phen HCFC free closed-cell rigid phenolic foam insulation.

- Insul-Phen has a .18 k-factor with a 5.56 R-Value at 1" thick. Insul-Phen is 100% CFC HCFC and halogen free.
- It exceeds ASTME84 25/50 flame and smoke up to 3" thick. Insul-Phen is a minimum 92% closed cell.
- Four densities (4) are available: 2.5# (.18 K factor), 3.75# (.19 K factor), 5.0# (.21 K factor), and 7.5# (.23 K factor).
- Three factory applied jackets are available; ASJ, VentureWrap and VentureClad.
- VentureWrap and VentureClad are both 0 perm and do not promote mold growth.
- Fittings and valves are fabricated in mitered sections and/or factory molded pieces.

SPECIFICATION/APPLICATION - Insulphen Rigid Phenolic Insulation

Piping: Ensure pipe is dry and free of debris. Coating the pipe for rust prevention is not required. Rust may be present on the pipe before installation and also will occur under any type of insulation with moisture present. If priming of the pipe is requested by owner or their representatives use Sherwin Williams PRO-Cryl® Universal Primer or approved equivalent.

Chilled Water:

- indoor conditioned areas and Existing buildings use minimum 1" thick. Indoor conditioned areas use 1" thick Insul-Phen 2.5# density up to 10" pipe and 1½" thick on 12" and larger.
- Joints and seams are to be firmly butted together.
- Vapor stops are to be installed/applied at 21 foot intervals using Childers CP-76 joint sealer or approved equal.
- Fittings and valves are to be of the same thickness as the adjoining insulation. Secure in place with ½" wide fiberglass filament tape and vapor seal with fab cloth embedded in Fosters 30-80AF or approved equal.
- **New construction, indoor non-conditioned areas** such as crawl space, attic, or mechanical rooms where outdoor air is present, or outdoors, **use minimum 1½" thick**. **Joint seal** and butt joints with CP-76 or approved equal. **In mechanical rooms or high traffic areas** subject to abuse or damage, **use 3.75# density** from the gound **up to 7 feet high**.

Heating Hot Water:

Insul-Phen 1 to 1½" thick will meet the International Energy Code (803.3.7) for all pipe sizes.

Pipe Supports:

The bottom 180 degrees of the support wil be high density material based on the table below.
For non standard application contact us for design calculations

Foam Density	Pipe Size	Saddle	Foam & Saddle Length	Centers
2.5#	4" and smaller	18 Gauge	12"	10'
3.75#	5" to 10"	16 Gauge	12"	10'
5.0#	12" to 16"	14 Gauge	12"	10'
5.0#	18" to 20"	10 Gauge	18"	10'
7.5#	24" and larger	8 Gauge	24"	10'

Other information:
This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Resolco Inc. The data on this document relates only to the specific material designated herein. Resolco Inc. assumes no legal responsibility for use or reliance upon this data. For information regarding specific applications of the product please contact Resolco Inc.

RESOLCO Inc.

Resolco, Inc., 6430A Antoine, Houston, Texas 77091 t: (713) 956-7376 f: (713) 956-7377 toll free: (877) 956-7376 www.resolco.com

5.3.10.3 Polypropylene 1/2 inch wide, 0.50 inch thick banding and clips, Q-Band/Q-Clip made by Band-It Inc. shall be used for securing PVC jacketing indoors. The banding shall not be used in food processing areas where bacterial growth is anticipated. Banding may be used for temporary securement until PVC joint adhesive cures. The PVC Jacketing must be completely sealed at all joints to prevent entry of water or moisture. In non food processing areas PVC jacketing should be glued using manufacturers adhesive.

5.3.11 Inspection Plugs

5.3.11.1 When specified, NDT Inspection plugs made from EPDM and aluminum metal cap as manufactured by Parker Special Products shall be installed on pipe and equipment requiring frequent inspections. Use 1 1/2 inch NDT plug for pipe and equipment insulation jacket OD of less than 9 inches. Use 2 1/2 inches and 3 inches NDT plug for pipe and equipment between 9 inches and 24 inches insulation jacket OD. Use 5 inches NDT plug for pipe and equipment insulation jacket OD above 24 inches.

5.3.12 Expansion/Contraction Joints

5.3.12.1 Expansion/contraction joint material shall be 1lb/ft³ density fiberglass blanket.

6.0 INSTALLATION

6.1 Application of Insulation (All Services)

6.1.1 General

6.1.1.1 The design requirements of this specification are general and where it is not specific, pipe insulation, pipe fitting, flange and valve insulation and curved segments shall be fabricated by an approved Resolco fabricator in compliance with ASTM C450 and ASTM C585.

6.1.1.2 Prior to installation of insulating material, its thickness shall be verified in accordance with the operating temperature and diameter of pipe and equipment. If thickness or material do not verify, Subcontractor shall contact Owner to resolve the conflict. The Subcontractor shall not in any case establish a new thickness or select different material without written approval.

6.1.1.3 The insulation shall be protected from moisture and weather before and during application. 6.1.1.4 All insulation and surfaces to be insulated shall be dry and free from moisture prior to application of insulation and vapor barrier.

6.1.1.5 Piping with 16 inch outside diameter and less shall be insulated with 2-piece "sectional" pipe insulation (Para.5.3.1.). Above 16 inch O.D., sectional pipe covering or prefabricated curved sidewall segments (Para. 5.3.1.7) may be used.

6.1.1.6 All insulation sections shall be trimmed and tightly butted to eliminate voids, gaps or open joints. Joint sealer shall not be used to fill these imperfections. The insulation shall be fitted to achieve tight fit.

6.1.1.7 Insulation ends shall be rubbed against each other to achieve tight fit prior to application of joint sealer if required.

6.1.1.8 Application of Joint Sealer

6.1.1.8.1 A vapor sealing joint sealer (Paragraph 5.3.2.1) 1/16 inch thick shall be applied to all circumferential and longitudinal joints of outer layer in multilayer installation and to all circumferential and longitudinal joints of single layer insulation. Joint sealer shall completely fill full thickness of these joints.

6.1.1.8.2 In arears of high humidity consideration should be given to the use of joint sealer at all longitudinal and circumferential joints, indoor and outdoor.

6.1.1.8.3 Layers of insulation shall not be bonded to each other. Excessive sealer in the joints should be avoided during application. Do not feather edge.

6.1.1.9 Application of Tape and Banding

6.1.1.9.1 Insulation shall be fastened circumferentially with 3/4 inch wide tape (Paragraph 5.3.10.1) 2 inches from each end and one in the middle of pipe section and a minimum of two tapes per each section of equipment insulation. The tapes shall be pulled tight to seal all joints. Bands shall be used above 16 inches O.D. and on all curved wall segments where tapes do not close insulation joints tightly.

6.1.1.9.2 All tapes shall be taped at least 50% on itself or overlapped by 2 inches.

6.1.1.9.3 Tightening of tapes or bands shall not crush or crack the insulation. Cracked or broken insulation shall be replaced. 6.1.1.9.4 The outer layer or single layer of equipment insulation shall be fastened with the use of T-304 stainless steel 1/2 inch wide bands at 12 inch centers.

RESOLCO Inc.

6.1.1.10 Application of Multiple Layers

6.1.1.10.1 Multiple layers shall be installed so the butt and longitudinal joints of one layer do not coincide with those of any other layer. The outer layer joints shall stagger inner layer joints by half sections. Minimum overlap shall be 18 inches.

6.1.1.10.2 Openings through the insulation shall be sealed vapor tight by applying joint sealer (Paragraph 5.3.2.1) between protrusion and insulation.

6.1.1.11 Application of Contraction Joint

6.1.1.11.1 Contraction joint for vertical piping and equipment shall be provided immediately below each insulation support ring.

6.1.1.11.2 Insulation support ring design for vertical piping. The support rings shall be installed for vertical runs over 21ft. (6.4m). The support ring shall be furnished and installed by the insulation contractor.

6.1.1.11.3 1 inch (25mm) space in each contraction joint shall be filled with 1lb/ft^3 (16 kg/m^3) density fiberglass blanket. Uncompacted 3 inch (75mm) thick fiberglass shall be compacted to 1 inch (25mm) thick.

6.1.1.11.4 Single layer and multilayer applications shall have an additional layer of equivalent thickness insulation installed as an outer cover over the contraction joint. Length of additional layer shall be 12 inches minimum.

6.1.1.11.5 Contraction joint in horizontal piping shall be installed in each layer of insulation. Joints shall be located midway between pipe supports and other protrusions through the insulation systems. Single layer contraction joints in horizontal piping shall have an additional layer of 12 inch long insulation collar.

6.1.1.11.6 Contraction joint spacing for horizontal and vertical lines shall be as shown in the following table:

Operating Temperature °F	Contraction Joint Spacing/LF
50 to 0	13
-1 to -50	7
-51 to -100	6

6.1.1.11.7 Vapor barriers must be maintained continuously over contraction joints by stepping up and then back down to the pipe insulation.

6.1.1.12 Application of Vapor Stops

6.1.1.12.1 The vapor stops shall be installed at all pipe supports and all changes in configuration such as elbows, flanges, valves, manways, nozzles and insulation terminations and all locations on piping and equipment requiring maintenance including instrumentation connections. Vapor stops are also required where straight pipe runs exceed 24ft between pipe supports.

6.1.1.12.2 Vapor stops shall be constructed using reinforced vapor barrier mastic (Paragraph 5.3.3.1). When the vapor stop is dry, the adjacent layer of insulation shall be installed using joint sealer (Paragraph 5.3.2.1).

6.1.1.13 Application of Insulation for Elbows, Valves and Fittings

6.1.1.13.1 Insulation material for bends and elbows shall be two piece prefabricated cover made from same insulation material and same thickness as for straight piping.

6.1.1.13.2 Insulation for fittings, valves and flanges shall be shop routed or fabricated by approved Resolco fabricator from pipe insulation in conformance with ASTM C450 and C585 (Paragraph 5.3.1.4).

6.1.1.13.3 The terminations of piping insulation at each side of flanged joint or valve shall allow sufficient clearance space for bolt removal and shall incorporate reinforced vapor stop. Voids between flange or valve body and the insulation cover shall be filled with 1lb/ft^3 resilient glass fiber.

6.1.1.13.4 Insulation shall be cut back below packing glands, leaving packing glands exposed and joint between insulation and valve body at the packing gland shall be filled with the joint sealer and termination sealed with vapor barrier mastic.

6.2 Cold Insulation Pipe Support

6.2.1 Pre-insulated pipe supports (paragraph 5.3.8) for cold service shall be used for supporting pipes. Pipe support spacing shall be calculated per each system allowing for pipe weight, insulation weight, pipe content weight and appropriate safety factor. The spacing shall be calculated by a qualified piping engineer or follow the project pipe support specification.

6.2.2 High compressive strength insulation such as Resolco Insul-Phen 3.75lb/ft^3, 5lb/ft^3 or 7.5lb/ft^3 phenolic foam (Paragraph 5.3.8.1) shall be used at the saddle supports. The bearing surface shall be calculated to withstand stresses on pipe support system. Refer to attachment I.

6.2.3 Insulation protection saddles made from stainless steel, painted or galvanized carbon steel (Paragraph 5.3.8.1) with 1800 arc shall be provided and installed at all pipe hangers and supports. The curvature of saddle shall fit the outside diameter of insulation.

6.2.4 Pipe insulation shall be fitted tight against cold shoe. Circumferential and longitudinal joints of cold shoe insulation shall be sealed with 1/16 inch thick joint sealer (paragraph 5.3.2.1).

6.2.5 Prefabricated shoe vapor barrier longitudinal lap shall be sealed using vapor barrier mastic (Paragraph 5.3.3.1). The circumferential lap shall be overlapped with vapor barrier mastic and reinforcing.

6.2.6 Insulation Subcontractor shall also maintain staggered joint construction on multilayer shoes. 6.2.7 The vapor sealed high density Insul-Phen shall be covered with vapor barrier and protective cladding of flat metal sheeting and the cold shoes shall be properly fastened upon completion of insulation work.

6.3 Vapor Barrier and Cladding (Indoor Service)

6.3.1 Application of ASJ Jacket

6.3.1.1 Fabricated insulation shall have factory applied integral All Service Jacket (ASJ) vapor barrier (paragraph 5.3.5.1). 6.3.1.2 In areas of high humidity or where mould/mildew is a risk, use Venture 1555U factory applied zero perm jacket.

6.3.1.3 Vapor barrier jacket must be sealed longitudinally by integral self sealing lap (SSL) and a 3 inch wide ASJ/Venture 1555U sealing tape. Butt joints shall be sealed with 3 inch ASJ/Venture 1555U sealing tape. Reinforced vapor barrier mastic may be applied over the longitudinal joints of ASJ/Venture 1555U in lieu of ASJ/Venture 1555U tape provided the mastic width is minimum 4 inches.

Butt joints shall also use reinforcing fabric in this application. Laps shall be placed at 10 o'clock or 2 o'clock. Use of staples for securing ASJ/Venture 1555U laps is prohibited.

6.3.1.4 ASJ/Venture 1555U jacket shall be wrinkle free and shall cover all outer surfaces of insulation.

6.3.1.5 NOTE: If Insulrap 30 or equal is chosen as alternate vapor barrier in heavy mechanical abuse areas (paragraph 5.3.5.2) SEE Paragraph 6.4.2 for application.

6.3.1.6 Irregular surfaces, contraction joints and fittings shall be vapor sealed with reinforced vapor barrier mastic (paragraph 5.3.3.1. and 5.3.4.1). Mastic shall be allowed to dry prior to application of PVC Jacketing.

6.3.2 Application of PVC Cladding

6.3.2.1 All indoor insulation after installation and/or sealing of ASJ/Venture 1555U jacket and mastic, shall be finished with PVC jacketing. See Paragraphs 5.3.9.1 - 5.3.9.1.3.

6.3.2.2 All flanges, valves and fittings shall be covered with Ceel-co Series 300 PVC heavy gauge fitting covers or equal. Minimum .028 inch thick.

6.3.2.3 All longitudinal and circumferential laps shall be seal welded with PVC solvent welding adhesive. Follow manufacturer's recommendation in handling and application of the adhesive. It is acceptable to use 1 1/2 inch SSL, self-sealing lap tape on longitudinal joints of jacket in addition to adhesive.

6.3.2.4 Laps shall have a minumum overlap of 2 inches on both the circumferential and longitudinal laps. Laps shall be located at 10 or 2 o'clock positions.

6.3.2.5 PVC sliding lap expansion-contraction joint shall be constructed by using 3 circumferential beads of CP-76 (Paragraph 5.3.2.1) in the middle of 6 inch wide lap. The beads shall be 1 inch apart. The circumferential bead shall be at least 1 1/2 inches away from the ends of overlap. The sliding joints shall be located near each end point and intermediate joints located no more than 20 feet apart. The plastic jacketing shall be held tight until cementing of longitudinal joints is completed. Expansion and contraction of pipe shall not bind, twist or crack PVC jacketing. At least one sliding joint shall be installed directly above contraction joint.

6.3.2.6 NOTE: For heavy mechanical abuse areas, install stainless steel metal lath (paragraph 5.3.9.1.2) cage a minimum of 1 inch spacer around sealed/finished insulation, vapor barrier and cladding.

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6.4 Vapor Barrier and Cladding (Outdoor Service)

6.4.1 General

6.4.1.1 All insulated surfaces shall be covered with a vapor barrier. The vapor barrier and metal weatherproofing shall be installed as soon as practical after the insulation work has been completed. The Vapor barrier shall be continuous on all surfaces including contraction joints, valves, flanges, etc.

6.4.1.2 All materials applied in one day shall have the vapor barrier applied the same day. Any exposed insulation shall be temporarily protected with a combination moisture and/or UV barrier such as black polyethylene film to keep rain water out. The film shall be sealed to pipe or equipment.

6.4.1.3 Mastics shall not be applied when ambient air temperature is below 40°F (4.4°C) or it is expected to be below 40°F (4.4°C) within 24 hours, unless manufacturer will specifically approve it's material for each individual application.

6.4.2 Insulrap 30, Alumaguard 60, VentureClad 1577CW or Equivalent Vapor Barrier (Outdoor Service)

6.4.2.1 Straight runs of piping and flat surfaces of equipment shall be vapor sealed with Insulrap 30 or equal/approved laminated vapor barrier jacket (paragraph 5.3.6.1 and 5.3.6.2) utilizing maximum width commercially available.

6.4.2.2 The Insulrap 30 or equal/approved jacket shall have a minimum of two inch overlap on all joints. Installed vapor barrier shall be smooth and wrinkle free. Liquid adhesive (Paragraph 5.3.6.2) shall be used to join laps of Insulrap or equal when application temperature is below 50°F or on dusty insulation and overlaps.

6.4.2.3 Butt strips: Cut a length of butt strip at least 2.5 inches longer than the outer circumference of the jacketed pipe cover. Apply a bead of CP-76 (Paragraph 5.3.2.1) sealant along the edge of the longitudinal joint the width of the butt strip. Remove release paper from end and embed the end in the sealant. Smooth the butt strip into place working down and under the cover, then up and over, finally overlapping the embedded end. Press and roll the overlap to provide a seal.

6.4.2.4 All protrusions through insulation shall be wrapped with Insulrap or equal/approved tape in spirals to provide continuous vapor barrier or mastic and reinforcing fabric is an acceptable alternate (Paragraph 5.3.3.1 and 5.3.4.1).

6.4.2.5 Apply Peel & Seal as Insulrap or equal/approved (6.4.2.1-6.4.2.4); exception: no adhesive on laps, ambient temperature must be above +60°F, use hand roller for laps.

6.4.3 Application of Vapor Barrier Mastic

6.4.3.1 A vapor barrier coating of mastic (Paragraph 5.3.3.1) reinforced with glass cloth (paragraph 5.3.4.1) shall be applied to all outer surfaces of irregular surfaces and fittings such as elbows, valves, valve packing glands, vessel heads etc.

6.4.3.2 Vapor barrier mastic shall be applied to a minimum total dry (cured) film thickness of 0.038 inch. or as recommend by the mastic manufacture.

6.4.3.3 The first layer of mastic shall be applied evenly by suitable means as a tack coat over insulation or vapor barrier with an approximate 0.032 inch wet film thickness, or per Manufacturer's requirements.

6.4.3.4 Reinforcing cloth shall then be stretched tight, embedded into the still tacky first layer of mastic with minimum three inch overlap.

6.4.3.5 Apply second layer of mastic with 0.032 inch thick wet film thickness or as recommended by the mastic manufacturer.

6.4.3.6 Vapor barrier mastic shall be carried from outer surface of insulation to the uninsulated metal parts of the vessel or piping to provide continuous vapor seal at all terminations, projections, nozzles, and caps.

6.4.3.7 Vapor barrier on attachments shall be extended an additional 6 inches over uninsulated surface.

6.4.3.8 The glass cloth shall be completely covered with mastic and there shall be absolutely no cracks, holes, thin spots or open joints in the vapor barrier.

6.4.3.9 The vapor barrier mastic shall be allowed to dry per Manufacturer's recommendation before application of metal jacketing.

6.4.3.10 Final dry thickness of vapor barrier shall be checked. The vapor barrier shall be continuous and shall be checked for cracks, thin spots and pinholes, etc. Unsatisfactory areas shall be repaired.

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6.4.4 Application of Metal Cladding for Piping

6.4.4.1 Metal jacketing shall be applied over all outer surfaces of vapor sealed insulation work located outdoors. See Paragraphs 5.3.9.2 - 5.3.9.2.3.

6.4.4.2 All openings in the jacket for nozzles, brackets, protrusions, etc. shall be cut as close as possible to achieve a tight fit. Silicone or butyl based caulking compound shall be used to seal all the projections and penetrations.

6.4.4.3 A minimum of two inch overlap shall be provided on all circumferential and longitudinal joints.

6.4.4.4 The longitudinal lap on horizontal piping and equipment shall be located alternatively at either 10 o'clock or 2 o'clock positions to shed rain water.

6.4.4.5 Circumferential lap shall have one band and intermediate bands shall be installed at 12 inch centers.

6.4.4.6 Jacketing on vertical pipes shall be supported by "S" clips made from stainless steel metal bands.

6.4.5 Application of Metal Cladding for Fittings

6.4.5.1 Preformed RPR Insul-Mate metal elbows or Childers Ell-Jac or Univers-Ells shall be used for diameter up to 12 inches. Metal gore elbows shall be used above 12 inches (Paragraph 5.3.9.2).

6.4.5.2 Smooth metal jacketing shall be used over flanges and flanged fittings.

6.4.5.3 Stainless Steel bands (Paragraph 5.3.10.2) shall be used for securing metal jacketing on gored and preformed elbow covers. Metal jacket shall have raised bead for proper closing of gores. No screws, pop rivets, etc.

6.4.5.4 Where pop rivets are used to secure irregular shapes, all holes shall be drilled before metal is put in place over the insulation. A 3 inch wide by 0.020 inch thick aluminum strip shall be taped to the vapor barrier under the seam to prevent puncture of the vapor barrier.

6.4.6 Application of Metal Cladding for Equipment

6.4.6.1 Aluminum, SEE Paragraphs 5.3.9.2 - 5.3.9.2.3, shall be used for all horizontal equipment, vessel heads, manways, nozzles and flashing.

6.4.6.2 Jacketing for horizontal and vertical cylindrical surfaces shall be applied with 3 inch circumferential and longitudinal laps, except 1 1/2 inches. corrugated jacketing shall be lapped a minimum of two corrugations.

6.4.6.3 Metal jacketing for vessel heads shall be one piece dish, or conical sections fitted to the insulation, or a single flat sheet bent at the edges for small diameter vessels. Head covers shall overlap the shell jackets by 4 inches. Head jacketing shall be fastened by means of 1/2 inch. X 0.020 inch stainless steel band, one for every gore. An additional metal band, minimum 4 inch wide shall be installed over the overlap and secured with stainless steel bands.

6.4.6.4 Metal jacketing on horizontal and vertical vessels shall be secured with 1/2 inch wide by 0.020 inch thick stainless steel T-304 bands spaced at 12 inch centers.

6.4.6.5 Metal screws, pop rivets, etc. shall not be used to secure metal jacketing. 6.4.6.6 Metal jacketing on vertical equipment shall be supported by "S" clips at 12 inch centers.

6.4.6.7 Circumferential lap shall have one band on overlap and intermediate bands shall be installed at 12 inch centers.

6.4.6.8 When metal band exceeds 25ft. between securement points, one breather (expansion) spring (paragraph 5.3.10.2) should be used for every 25ft. of band length.

6.4.6.9 Intermediate bands on vertical jacketing shall be held in place by "U" clips on 48 inch centers. The "U" Clips shall be secured with pop rivets secured to the ridge of corrugations.

6.4.6.10 Weatherproofing shall be inspected for specified metal thickness, bank spacing, overlaps, caulking, U and S clips.

7.0 INSPECTION

7.1 Inspection Plugs

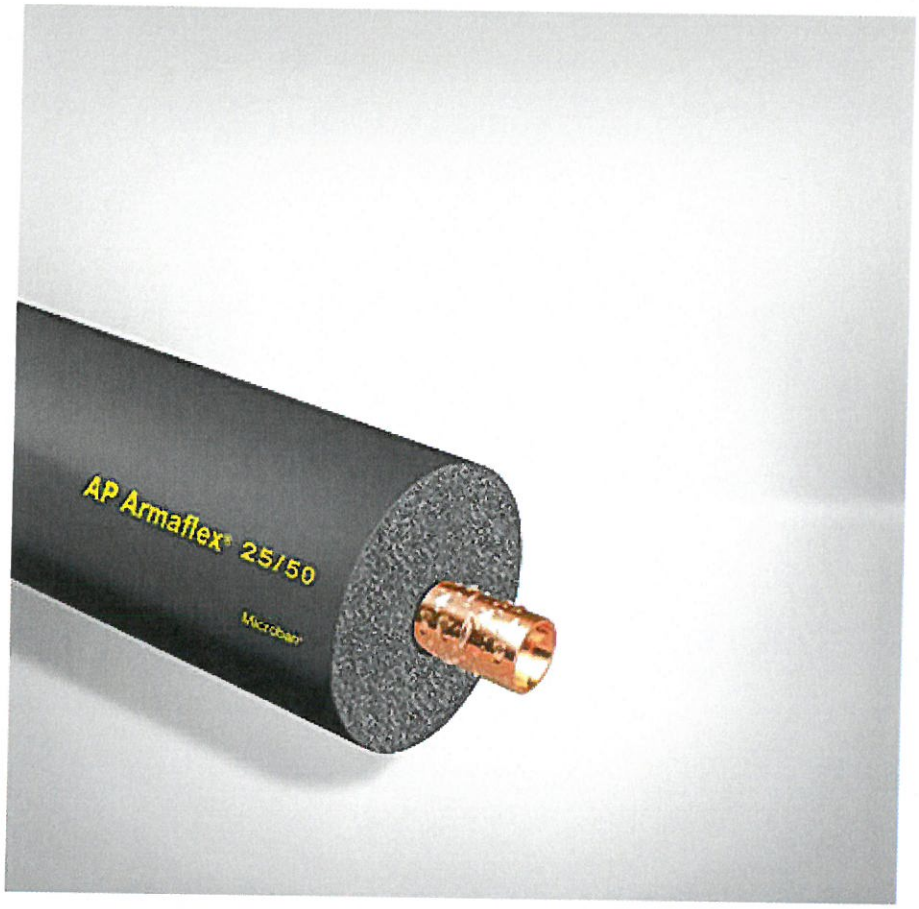
7.1.1 Inspection plugs (paragraph 5.3.11.1) shall be installed per the owner's inspection and maintenance guideline criteria. As a minimum they shall be located where ultrasonic testing is planned by the owner.

APPENDIX 4.1.D – COOLING CONDENSATE PIPING INSULATION PRODUCT DATA

armacell®

ARMACELL PRODUCT SELECTOR

HOME » ARMACELL PRODUCT SELECTOR » MECHANICAL INSULATION » AP ARMAFLEX TUBES









AP Armaflex Tubes

Tube Insulation

AP Armaflex, the world's most recognized brand of closed-cell foam insulation, provides superior protection against thermal losses, condensation and moisture accumulation that leads to mold. It is the ideal choice for insulating mechanical piping systems. Now offering Larger 8" and 10" IDs for ease of installation on larger pipe sizes.

Schools, hospitals, government institutions and commercial spaces of all types value the long-term performance and peace of mind that AP Armaflex lends to mechanical piping systems. Its moisture-resistant characteristics make it especially valuable on chilled-water and refrigeration piping where condensation might otherwise soak through fibrous types of insulations, significantly degrading their thermal performance, leaving them susceptible to fungal growth and ultimately shortening their lifecycle. Moisture-resistant AP Armaflex, however, maintains its physical and thermal integrity -- for the life of the mechanical system!

OVERVIEW | SPECIFICATIONS | ACCESSORIES

Specifications

Black or off-white flexible closed-cell elastomeric thermal insulation in a tubular form

Sizes

- Wall Thickness (nominal): 3/8", 1/2", 3/4", 1", 1-1/2", 2" (10, 13, 19, 25, 38, 50mm)
- Inside Diameter, Tubular: 3/8" ID to 10"ID (10mm ID to 250mm)
- Length of Sections, Feet, Tubular: 6' (1.8m). Some larger sizes may be shipped in two 3' sections.
- Specifications Compliance:
- ASTM C 534, Type I — Grade 1
- ASTM D 1056, 2B1
- ASTM E 84, NFPA 255, UL723
- ASTM G21/C1338
- ASTM G22
- CAN/ULC S102
- MEA 107-89M
- MIL-P-15280J, FORM T
- MIL-C-3133C (MIL STD 670B)
- Grade SBE 3
- NFPA 90A, 90B
- UL 181
- UL 94 5V-A, V-0, File E55798
- City of LA - RR 7642

Approvals, Certifications, Compliances:

- Key physical properties are approved by Factory Mutual.

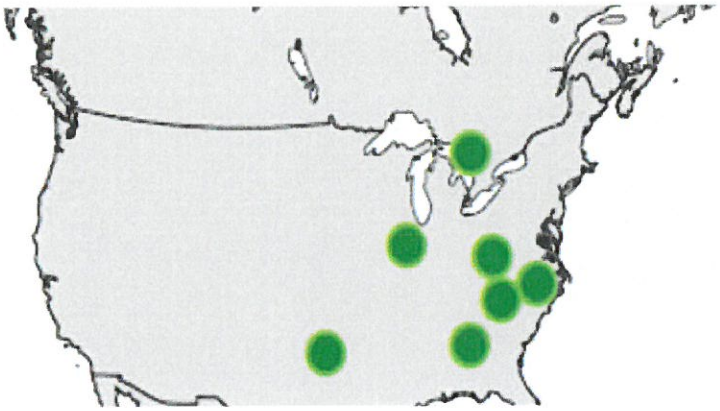
- GREENGUARD Gold Certified
- Manufactured without CFCs, HFCs, HCFCs, PBDEs, or Formaldehyde.
- Made with EPA registered Microban® antimicrobial product protection*
- All Armacell facilities in North America are ISO 9001:2008 certified.

R-Values:

Link to the AP Armaflex Tolerances and R-values table here.

For complete Specification details, download the product submittal sheet.

***Microban antimicrobial product protection is limited to the product itself and is not designed to protect the users of these products from disease causing microorganisms, food borne illnesses, or as a substitute for normal cleaning and hygiene practices. Microban International, Ltd. makes neither direct nor implied health claims for the products containing Microban® antimicrobial product protection. Data, photomicrographs and information presented are based on standard laboratory tests and are provided for comparative purposes to substantiate antimicrobial activity for non-public health uses.**



Did you know?

Armacell has 6 manufacturing facilities in the US and 1 in Canada. That means almost any product you order in North America is made in North America. Some exceptions apply.

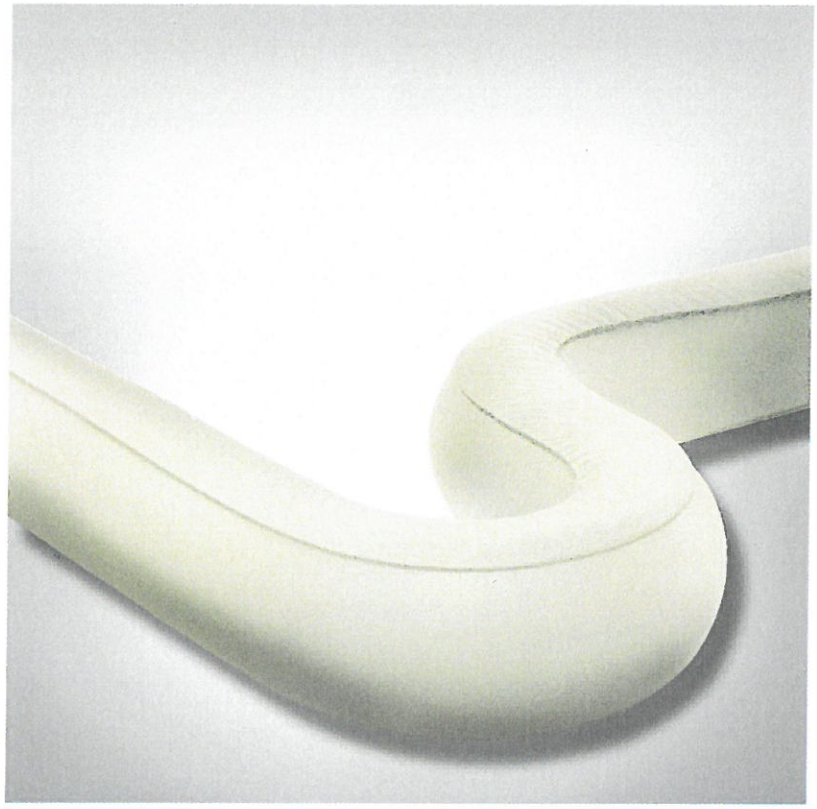
» MADE IN USA

Related Products

AC Accoflex

The closed-cell, elastomeric pipe insulation choice for the HVAC/R professional.

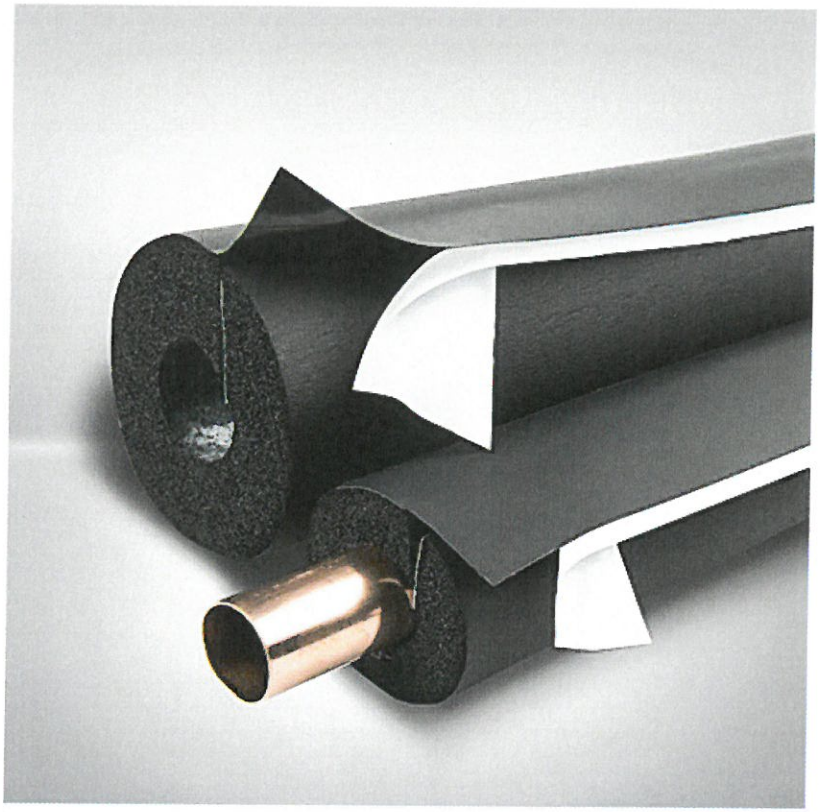
VIEW PRODUCT DETAILS



AP Armaflex White LapSeal

White flexible closed-cell elastomeric thermal insulation tubes with a reinforced lap seal.

VIEW PRODUCT DETAILS



AP Armaflex Black LapSeal

The original Armaflex fiber-free elastomeric pipe insulation with a flexible lap seal closure.

VIEW PRODUCT DETAILS

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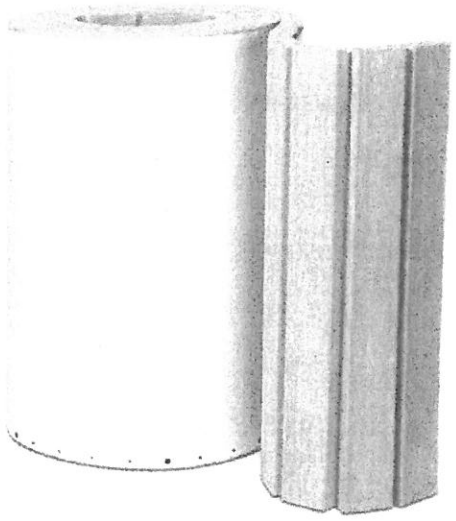
APPENDIX 4.1.E – BUILDING HEATING WATER PIPING INSULATION PRODUCT DATA

Fiberglas™ Pipe & Tank Insulation

Fiberglas™ Pipe and Tank Insulation provides a flexible insulation product for wrapping pipes, tanks, or irregularly shaped objects while providing excellent rigidity and abuse resistance.



DESCRIPTION

Owens Corning's versatile Fiberglas™ pipe and tank insulation is a semi-rigid insulation with a factory-jacketed FRK or ASJ Max encapsulated-paper jacket. It's flexible enough to be used in many different applications while providing the rigidity and thermal performance you need for a well-insulated system.

APPLICATION/USE

Fiberglas™ Pipe and Tank insulation provides thermal protection for a variety of objects and shapes. Fits pipes and equipment of 10" NPS and larger.

- Pipes
- Tanks
- Pipe flanges
- Valves
- Groups of parallel pipes
- Pipes with heat tracing lines

FEATURES & BENEFITS

- May be applied over existing insulation to increase thickness and conserve energy
- Vertical fiber orientation with a durable, high-compressive strength makes it strong and abuse resistant

ASJ Max Jacket

- Durable, cleanable poly-encapsulate paper jacket that doesn't support mold or mildew growth
- Resists/sheds water when exposed to intermittent, short-duration precipitation during construction
- Less wicking and curling than standard ASJ
- Accepts paint and mastic as well as standard ASJ
- Higher puncture resistance than standard ASJ
- Has a finished appearance that is compatible with standard ASJ

SPECIFICATIONS

Availability

Thickness		Facing	Recommended Pipe Size	Roll Length	
in.	(mm)		NPS in. (DN, mm)	ft.	(m)
1	(25)	ASJ Max	10 (250) +	42	(12.8)
1-½	(38)	ASJ Max	10 (250) +	27	(8.2)
2	(51)	ASJ Max	10 (250) +	20	(6.1)
2	(51)	FRK	10 (250) +	20	(6.1)
2-½	(64)	ASJ Max	14 (350) +	26	(7.9)
2-½	(64)	FRK	14 (350) +	26	(7.9)
3	(76)	ASJ Max	17 (425) +	21	(6.4)
3-½	(89)	ASJ Max	20 (500) +	18	(5.5)
4	(102)	ASJ Max	23 (575) +	16	(4.9)

MTO (Made to Order). Product availability subject to change. View product guide for details. All rolls are 36" wide.

Physical property data

Property	Value	Test Method
Pipe/equipment Operating Temperature (single-layer application)	0°F to 650°F (–18°C to 343°C)	ASTM C411
Insulation Jacket Temperature Limitation	–20°F to 150°F (–29°C to 66°C)	ASTM C1136
Jacket Permeance	0.02 perm	ASTM E96, Proc. A
Minimum Burst Strength	100 psi	ASTM D774/D774M
Compressive Strength at 10% Deformation	125 lb./ft² (5985 Pa) min.	ASTM C165
Surface Burning Characteristics[1]	Flame Spread: 25 Smoke Developed: 50	ASTM E84

1. The standard used to determine surface burning characteristics measures and describes the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment, which takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest 5 rating.

Installation instructions

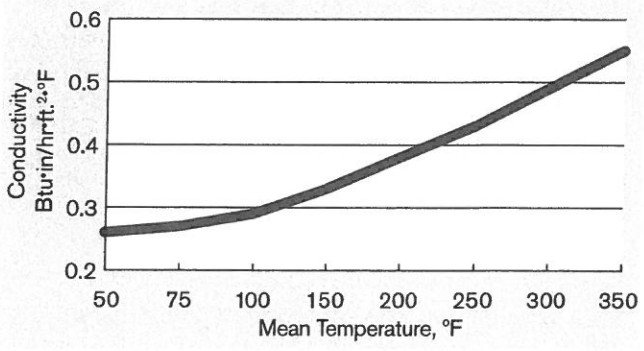
1. Measure the length of insulation required according to the fabrication guide located on the carton.
2. Cut completely through the insulation and jacket. Use a flap tool to fillet a stapling flange on one end of the insulation.
3. Each section of insulation may be secured around the pipe using either outward-clenching staples and mastic or outward-clenching staples and pressure-sensitive, vapor-retarder tape.
4. Adjacent sections must be tightly butted together and then sealed with vapor-retarder tape.

Additional installation instructions

- Special care must be taken to vapor-seal systems operating below ambient temperatures.
- If indoor applications will be painted, use only a water-based latex paint.
- Outdoor applications require protection from weather.

Thermal conductivity

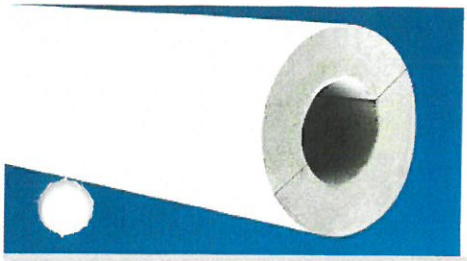
Mean Temperature °F	k*	Mean Temperature °C	λ*
50	0.26	10	0.037
75	0.27	25	0.040
100	0.29	50	0.045
150	0.33	75	0.050
200	0.38	100	0.056
250	0.43	125	0.063
300	0.49	150	0.070
350	0.55	175	0.078



* k = Btu•in/hr•ft²•°F; λ = W/m•°C

Apparent thermal conductivity data determined in accordance with ASTM Practice C1045 with data obtained by ASTM Test Method C335. Values are nominal, subject to normal testing and manufacturing tolerances.

APPENDIX 4.2.A – INSUL-PHEN INSTALLATION DIAGRAMS



INSUL-PHEN
GREEN INSULATION

Vapor Barrier Jacket / Tape / Self Seal Lap Detail

Figure 1

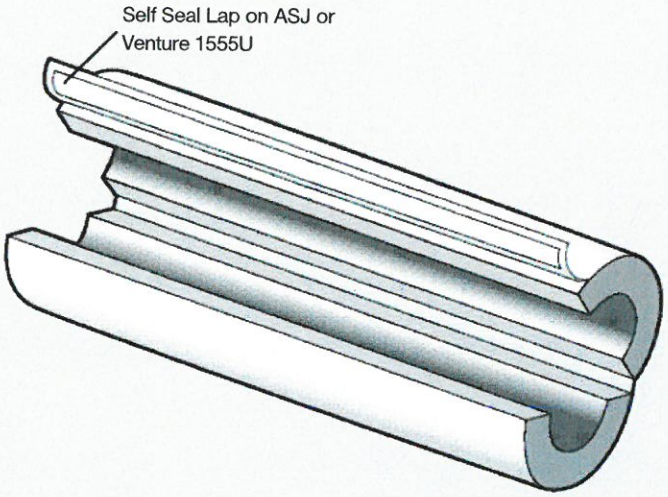
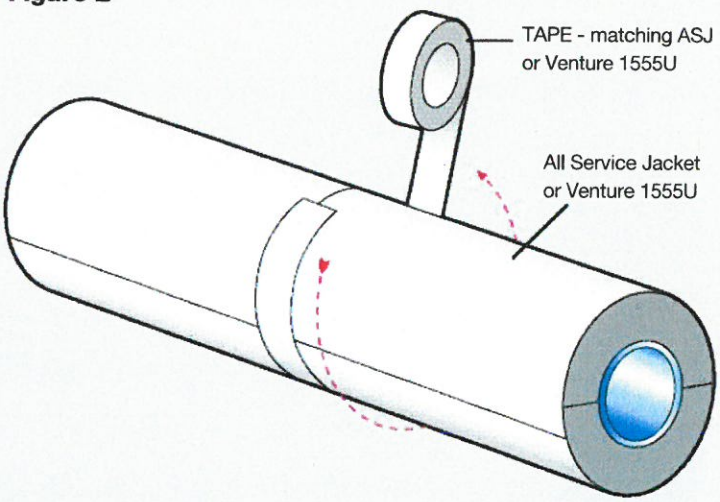
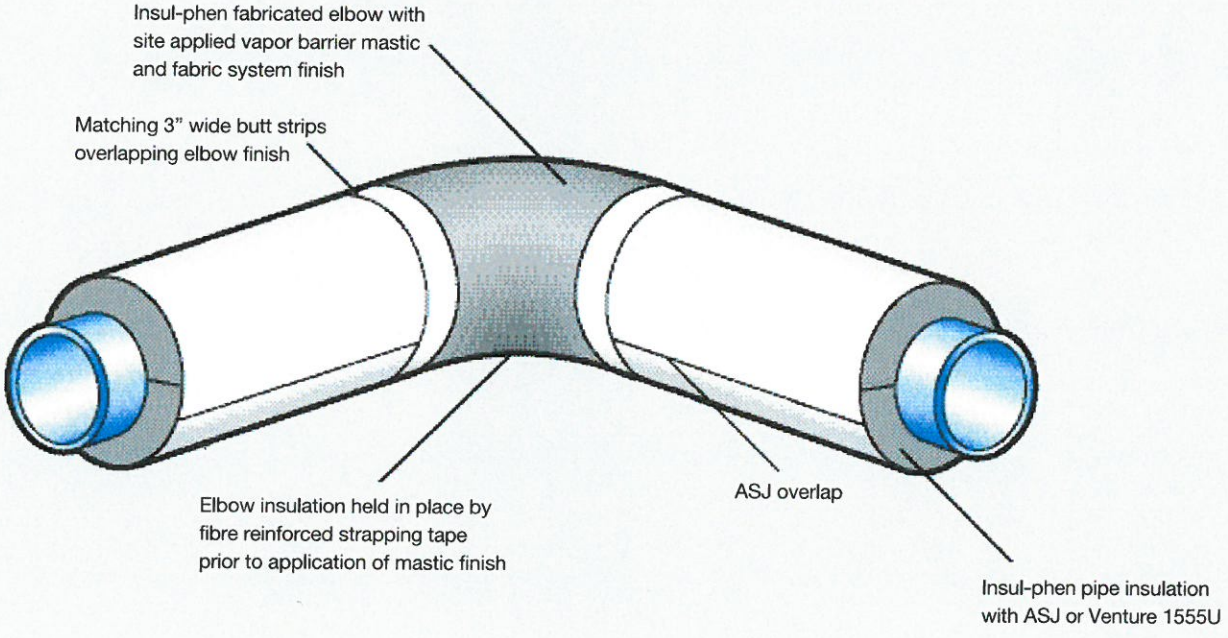


Figure 2



Pipe Elbow

Figure 3



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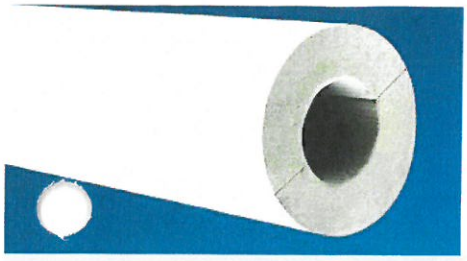
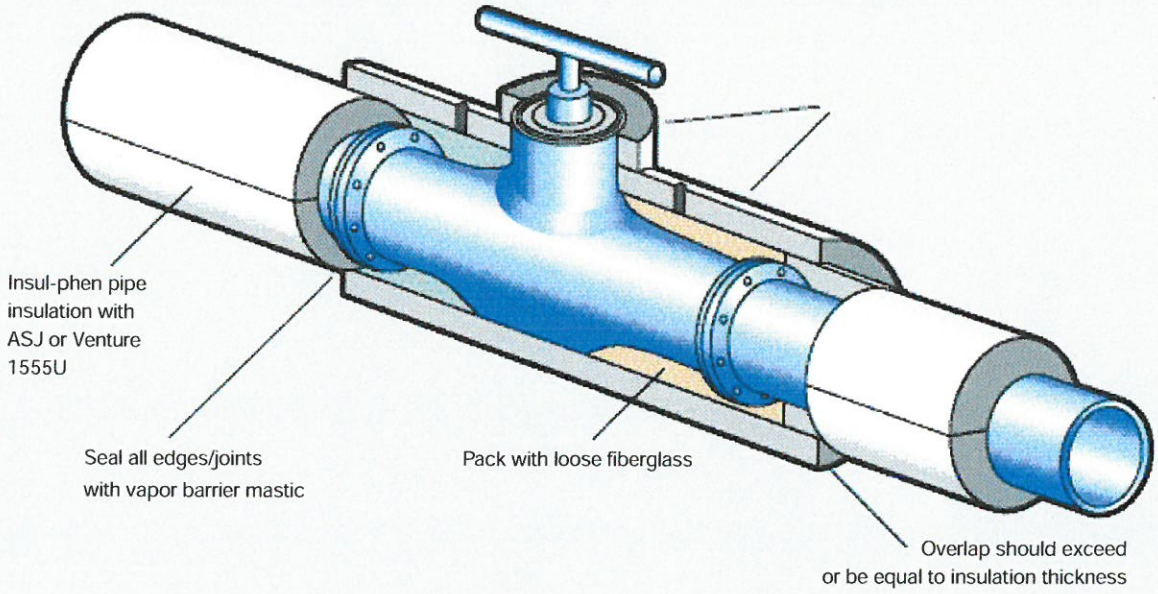


INSUL-PHEN
GREEN INSULATION

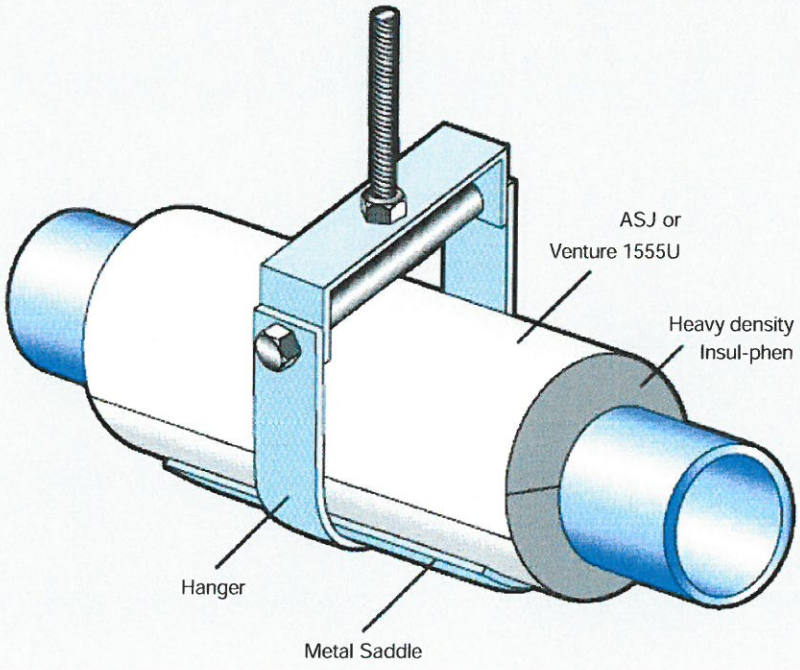
Valve / Fitting Insulation Detail

Figure 4



Pipe Hanger Support Detail

Figure 5



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