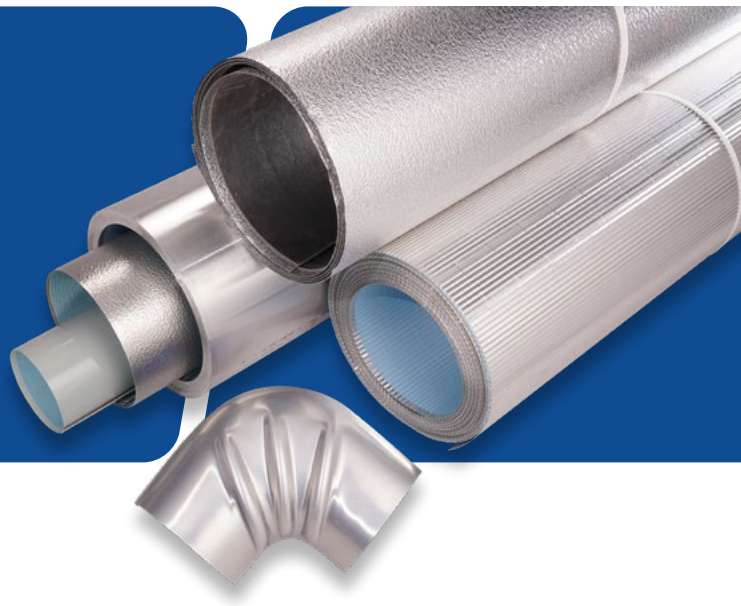
Johns Manville
A Berkshire Hathaway Company

METAL JACKETING

Installation Guide



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SECTION 1 – SCOPE

1.1 This guideline covers the installation of Johns Manville aluminum and stainless steel jacketing products on insulated pipe including elbows, valves, and other fittings.

1.2 Product data sheets and other JM literature are referenced throughout this guideline. Visit jm.com for the latest version of these documents.

1.3 The information contained in this guideline and referenced JM documents are current as of the issue date. This guideline is subject to revision without notice. Visit www.jm.com or contact the Johns Manville Customer Information Group at 1-800-231-1024 or your local JM representative for the most recent version of this guideline or other JM referenced literature.

1.4 Due to the variations in service conditions and use, this guideline may not be pertinent for every application. A design or specifying engineer can create specifications tailored to particular applications or owner's needs. Such a design or specification engineering service may be more familiar with local conditions, budgets, environment, and desired service life of the system allowing them to generate a more precise specification.

1.5 It is the intent of this document to provide guidelines for the installation of Johns Manville brand aluminum and stainless steel insulation jacketing products. This guideline may not be suitable and shall not be used for the purpose of installing another insulation manufacturer's products. While supplemental insulation system products may be referenced in this guideline, JM recommends consulting the manufacturers of such products for proper installation and handling.

1.6 This guideline is offered as a guide for the purpose described herein. No warranty of procedures, either expressed or implied, is intended. All other express or implied warranties of merchantability or fitness for a particular purpose are disclaimed.

SECTION 2 – GENERAL

2.1 All surfaces shall be free of foreign substances prior to the application of insulation jacketing.

2.2 All jacketing material shall be delivered to the project site in original unbroken factory packaging labeled with product designation and metal thickness.

2.3 Metal jacketing shall be stored in a dry area before use. Water staining may occur due to improper storage before installation.

2.4 All testing of piping systems shall be completed prior to the installation of the insulation system.

SECTION 3 – MATERIALS OF CONSTRUCTION

3.1 Metal Jacketing Materials for Pipe & Fittings - General

3.1.1 Insulation jacketing shall be aluminum and/or stainless steel roll, or cut & roll jacketing, elbows, and accessories manufactured by Johns Manville.

3.1.2 Aluminum or stainless steel protective jacketing shall not be considered a vapor retarder.

3.1.3 A pipe coating system may be recommended to minimize the likelihood of corrosion of the underlying pipe. Refer to Appendix A for conditions where pipe coating systems are suggested.

3.1.4 Where required, safety edges or safety hems may be used on metal jacketing. A safety edge consists of a de-burred or rounded edge. A safety hem shall be folded such that the original edge is on the underside of the jacketing and shall be 3/8" to 1/2" in width. A safety hem shall not be used on 3/16" or deep corrugated jacketing.

3.2 Aluminum Jacketing

3.2.1 Aluminum jacketing shall comply with the requirements of ASTM C1729 Standard Specification for Aluminum Jacketing for Insulation and shall be classified per ASTM C1729 as follows:

3.2.1.1 Standard Roll or Sheet Aluminum Jacketing
- 3.2.1.1.1 Properties: Bare surface, 3105/3003 alloy, H14 temper, 3 mil polyfilm moisture barrier
- 3.2.1.1.2 Classification: Type I, Grade 1, Class A, 0.016-0.024" thick

3.2.1.2 Standard Roll or Sheet Aluminum Jacketing for Extra Corrosive Environments
- 3.2.1.2.1 Properties: Painted surface, 3105/3003 alloy, H14 temper, 3 mil polyfilm moisture barrier
- 3.2.1.2.2 Classification: Type II, Grade 1, Class A, 0.016-0.024" thick

3.2.1.3 Heavy Duty Sheet or Roll Aluminum Jacketing for High Abuse Areas
- 3.2.1.3.1 Properties: Bare surface, 3105/3003 alloy, H12 temper, 3 mil polyfilm moisture barrier
- 3.2.1.3.2 Classification: Type I, Grade 2, Class A, ≥0.032" thick

3.2.1.4 Ell-Jacs Plus Two-Piece Aluminum Elbows
- 3.2.1.4.1 Properties: Clear painted outer surface, 1100 alloy, 0 temper, polyfilm moisture barrier
- 3.2.1.4.2 Classification: Type III, Grade 3, Class A, 0.024" thick

3.2.1.5 Deep Corrugated Aluminum Sheet Jacketing
- 3.2.1.5.1 Properties: Bare or painted surface, 3105/3003 alloy, H14 or H12 temper, 3 mil polyfilm moisture barrier
- 3.2.1.5.2 Classification: Type I or II, Grade 1 or 2, Class A, 0.016-0.040" thick

3.2.1.6 Box Rib Aluminum Sheet Jacketing
- 3.2.1.6.1 Properties: Bare surface, 3004 or Alclad 3004 alloy, no moisture barrier

3.2.6 Refer to Table 1 in Appendix B for recommended aluminum jacketing thickness based on outer diameter of insulation and compressive strength of the insulation.

3.2.7 Aluminum Elbows/Fittings and Irregular Surfaces

3.2.7.1 Aluminum jacketing for 90° and 45° pipe elbows/fittings shall be two-piece pressed elbow covers from Johns Manville where available in required sizes. Refer to Table 3, Table 4, Table 5, and Table 6 in Appendix B or the Johns Manville Fitting Selection Guide for sizing information.

3.2.7.2 For some larger pipe sizes where two-piece pressed elbow covers are not available, aluminum jacketing for 90° elbows/fittings shall be four-piece pressed elbow covers from Johns Manville (available for limited pipe sizes and insulation thicknesses between 10" and 18" NPS). Consult Table 3 in Appendix B or the Johns Manville Fitting Selection Guide for sizing information.

3.2.7.3 For larger size elbows/fittings where two- or four-piece pressed elbow covers are unavailable, aluminum elbows shall be gores fabricated to fit closely around insulation.

3.2.7.4 Aluminum jacketing for tees, valves, flanges, caps, etc. shall be factory or field-fabricated to fit closely around insulation.

3.2.7.5 Aluminum pressed elbow covers shall have an acrylic or polyester painted moisture barrier on the interior surface to help prevent corrosion of the interior surface of the jacketing.

3.2.7.6 Aluminum pressed elbow covers shall have a factory applied, baked on finish of highly durable hard film clear acrylic or polyester paint on the exterior surface to help prevent external corrosion and to raise the emittance.

3.3 Stainless Steel Jacketing

3.3.1 Stainless steel jacketing shall comply with the requirements of ASTM C1767 Standard Specification for Stainless Steel Jacketing for Insulation and shall be classified per ASTM C1767 as follows:

3.3.1.1 Standard Roll or Sheet Stainless Steel Jacketing

3.3.1.1.1 Properties: Bare surface, T304/T304L alloy, annealed temper, 3 mil polyfilm moisture barrier

3.3.1.1.2 Classification: Type I, Grade 1, Class A, 0.010-0.024" thick

3.3.1.2 Standard Roll or Sheet Stainless Steel Jacketing for Extra Corrosive Environments

3.3.1.2.1 Properties: Bare surface, T316/T316L alloy, annealed temper, 3 mil polyfilm moisture barrier

3.3.1.2.2 Classification: Type I, Grade 2, Class A, 0.010-0.024" thick

3.3.1.3 Two-Piece Stainless Steel Elbows

3.3.1.3.1 Properties: Bare surface, T316/T316L alloy, annealed temper

3.3.1.3.2 Classification: Type I, Grade 2, Class E, 0.016" thick

3.3.1.4 Deep Corrugated Stainless Steel Sheet Jacketing

3.3.1.4.1 Properties: Bare surface, T304/T304L or T316/T316L alloy, annealed temper, 3 mil polyfilm moisture barrier

3.3.1.4.2 Classification: Type I, Grade 1 or 2, Class A, 0.010-0.024" thick

3.3.2 The stainless steel jacketing alloys shall comply with the requirements of ASTM A240.

3.3.3 Stainless steel roll and cut & roll jacketing shall have a 3-mil thick polyfilm moisture barrier factory heat laminated to the inside surface to help prevent corrosion of the interior surface of the jacketing.

3.3.4 Stainless steel jacketing shall be used when its superior flame or corrosion resistance is required. Consult Johns Manville for stainless steel alloy recommendations for corrosive environments.

3.3.5 Refer to Table 2 in Appendix B for recommended stainless steel jacketing thickness based on outer diameter of insulation and compressive strength of the insulation.

3.3.6 Stainless Steel Elbows/Fittings and Irregular Surfaces

3.3.6.1 Stainless steel jacketing for 90° and 45° pipe elbows/fittings shall be two-piece pressed elbows from Johns Manville where available in required sizes. Refer to Table 3, Table 4, and Table 5 in Appendix B or the Johns Manville Fitting Selection Guide for sizing information.

3.3.6.2 For larger size elbows/fittings where pressed elbow covers are unavailable, stainless steel elbows shall be gores fabricated to fit closely around insulation.

3.3.6.3 Stainless steel jacketing for tees, valves, flanges, caps, etc. shall be factory or field-fabricated to fit closely around insulation.

3.4 Banding

3.4.1 For aluminum jacketing and aluminum elbow covers, banding can be aluminum or stainless steel. Due to the tensile strength characteristics, stainless steel banding shall be used in most applications. Refer to Figure 1.

3.4.2 Aluminum Banding

3.4.2.1 Aluminum banding shall only be used where all of the following apply:

- Aluminum jacketing and fitting covers are used.
- The thickness of the aluminum jacketing does not exceed that of the banding.
- The banding will not be subjected to excessive forces due to wind load, expansion/contraction of the insulation system, or other factors.
- The environment is not particularly corrosive.
- The insulation outer diameter is ≤8".
- A non-rigid insulation material is used.

3.4.2.2 Where the above criteria are met, aluminum banding for roll, cut & roll, and elbow applications shall be 0.020" thick by ½" or ¾" wide and composed of alloys 3105 or 3003.

3.4.3 Stainless Steel Banding

3.4.4 For applications that do not meet all of the above criteria in section 3.4.2.1, including all applications with stainless steel jacketing and stainless steel elbow covers, stainless steel banding shall be used.

3.4.5 Stainless steel banding for roll, cut & roll, and elbow applications shall be 0.020" thick stainless steel composed of alloys T304 or T316 with annealed temper. For all outer insulation diameters (OD) less than 16", ½" wide or ¾" wide stainless steel banding shall be used. For 16" OD and above, ¾" wide stainless steel banding shall be used.

3.4.6 Although 0.020" thick stainless steel banding is recommended for all pipe sizes, 0.015" stainless steel banding may be acceptable for small diameter piping with non-rigid insulation.

3.5 Wing Seals

3.5.1 The material and width of wing seals selected shall match that of the banding selected.

3.5.2 Aluminum wing seals shall be 0.032" thick by ½" or ¾" wide and composed of alloys 3105 or 3003.

3.5.3 Stainless steel wing seals shall be 0.032" thick by ½" or ¾" wide and composed of alloys T304 or T316 with annealed temper.

3.6 Tensioners

3.6.1 Banding shall be applied using the MIP 1800 Pusher Bar Tensioner (also known as a pistol grip tensioner).

3.6.2 If preferred for large diameter pipe with ¾" wide banding, banding may be applied using the MIP 1900 Windlass Pusher Tensioner (also known as a ratchet tensioner).

3.6.3 For applications in confined areas, the MIP 1920 Compact Windlass Pusher Tensioner may be preferred due to its shorter handles.

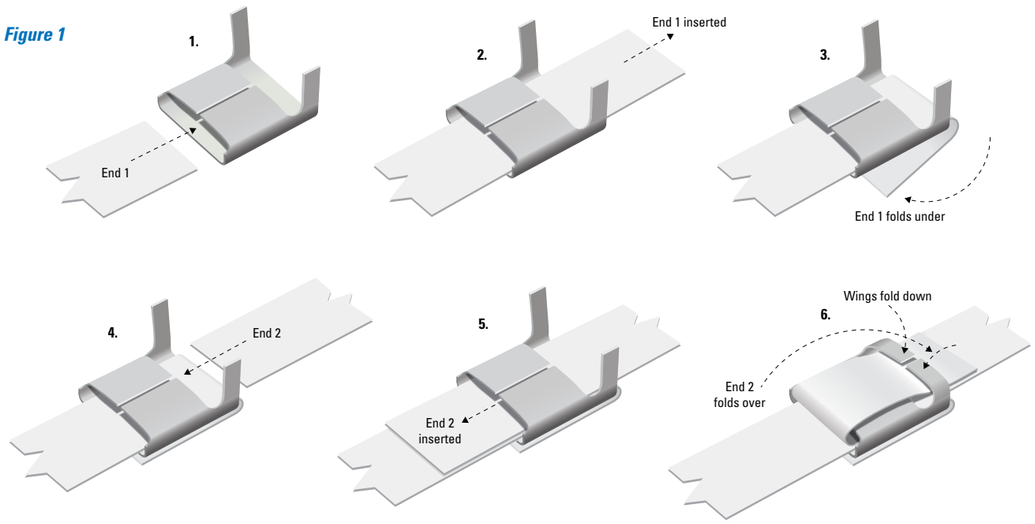
3.7 Jacketing/Flashing Sealants

3.7.1 Jacketing/flashing sealants shall be vapor retarder type, moisture and water resistant, non-hardening, and flexible with a service temperature range from -40°F to 250°F.

3.7.2 Flashing sealants shall be used to seal around protrusions and insulation terminations.

3.7.3 Typical flashing and jacketing sealants include Childers Chil-Byl CP-76 and Foster Elastolar 95-44 from H.B. Fuller Construction Products Inc. (www.fosterproducts.com) or approved equal. Consult sealant manufacturer for recommended products.

Figure 1



SECTION 4 – APPLICATION

4.1 Metal Jacketing Application - General

4.1.1 Refer to sections 3.2 and 3.3 for material specifications for aluminum and stainless steel jacketing, respectively.

4.1.2 Metal jacketing shall be used for all piping or equipment located outdoors including, but not limited to, process areas, rooftops and rooftop equipment.

4.1.3 Metal jacketing shall be used indoors where greater resistance to physical damage is required, for appearance, for improved fire resistance, or as otherwise preferred.

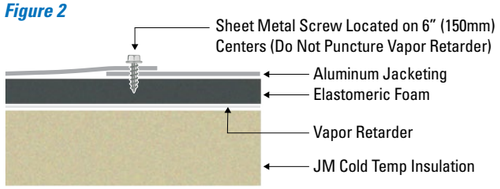
4.1.4 Before jacketing is installed on a portion of the piping, any vapor retarder system on that portion must be complete and continuous.

4.1.5 Metal jacketing shall be applied over dry insulation or vapor retarder.

4.1.6 Neatly secure straight sections of jacketing with bands and seals with a maximum spacing of 9 in (229 mm) on center. Secure end joints with bands and seals centered directly over joint. Do not use screws, staples, or other fasteners that can penetrate the vapor retarder.

4.1.7 In areas where screws or rivets are needed to secure the metal jacketing (examples being equipment heads and protrusions, such as valves, nozzles and T's), install a sacrificial layer of elastomeric foam over the primary vapor retarder to prevent punctures resulting in damage to the vapor retarder or underlying insulation. It is recommended to use #8x1/2" stainless steel screws in these applications. See Figure 2.

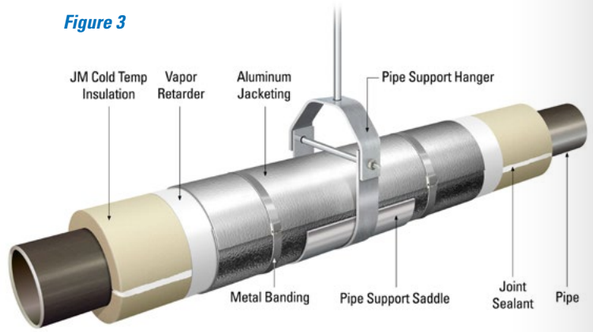
Figure 2



4.1.8 Roll or cut & roll jacketing shall be cut and rolled to conform reasonably to the outer circumference of the insulation on the pipe.

4.1.9 Metal jacketing shall be applied in a continuous fashion through pipe hangers or supports. Refer to Figure 3.

Figure 3

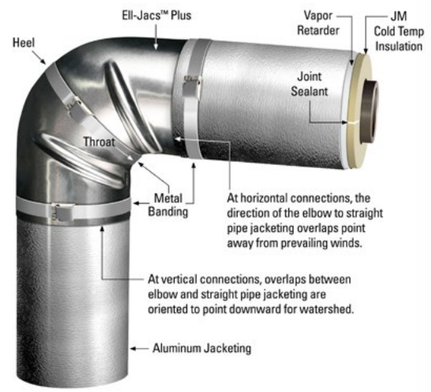


4.2 Jacketing Overlaps

4.2.1 Metal jacketing overlaps at joints shall be positioned in an orientation to best avoid water infiltration. Whenever possible, openings at joints shall point downward or away from prevailing winds to naturally shed water.

4.2.2 Refer to Figure 3, Figure 4, and Figure 5 for diagrams of longitudinal and circumferential joints and elbow heel and throat as indicated in this guide.

Figure 4



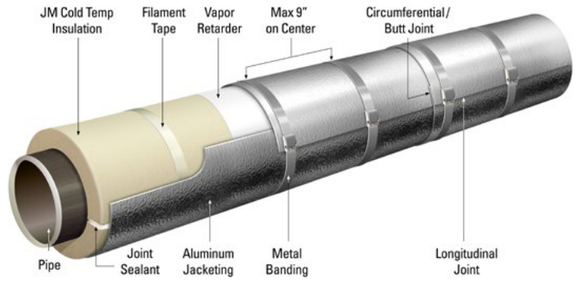
4.2.3 Metal jacketing overlaps shall be a minimum of 2" at joints between straight pipe jacketing sections.

4.2.4 Metal jacketing overlaps at joints between elbows and straight pipe jacketing shall be of sufficient length to avoid gaps and the joint oriented to naturally shed water or face away from prevailing winds.

4.2.5 On straight pipe, the longitudinal overlap shall be a minimum of 2" at less than 16" outer insulation diameter. A minimum 3" overlap shall be used on 16" outer insulation diameter and above.

4.2.6 On horizontal straight pipe, the longitudinal joint shall be located at the 3 to 4 o'clock or 8-9 o'clock position and the joint opening shall point downward in order to shed water. Refer to Figure 3, Figure 5, and Figure 7.

Figure 5



4.2.7 On vertical straight pipe, each higher jacketing piece shall overlap the piece below it at joints in order to shed water.

4.2.8 The overlap of aluminum elbow covers shall be a minimum of 5/8" at both the heel and throat (longitudinal) joints when the insulation outer diameter conforms to ASTM C585 or C450.

4.2.9 For horizontal elbows, the top piece shall overlap the bottom piece at both the heel and throat joints. The direction of heel and throat overlap for vertical elbow covers should be such that the resulting joints face away from any prevailing winds.

4.2.10 For vertical elbows, the joints shall be installed such that the opening points downward in order to shed water. For the elbow at the top of vertical straight pipe, the elbow cover shall be positioned on top of the straight pipe jacketing below it. For elbows located at the bottom of vertical straight pipe, the straight pipe jacketing shall be positioned on top of the elbow cover below it.

4.2.11 Where elbows meet horizontal straight pipe, the joints shall be installed such that the opening of the resulting joints point away from any prevailing winds.

4.3 Jacketing/Flashing Sealant

4.3.1 Jacketing with sealant is optional on below-ambient temperature systems and should not be used for ambient or above applications.

4.3.2 When jacketing sealant is used, it shall be applied in the jacketing joint between the overlapping pieces of metal and not as a bead of caulk on the exterior lip of the jacketing joint. Refer to Figure 6.

Figure 6

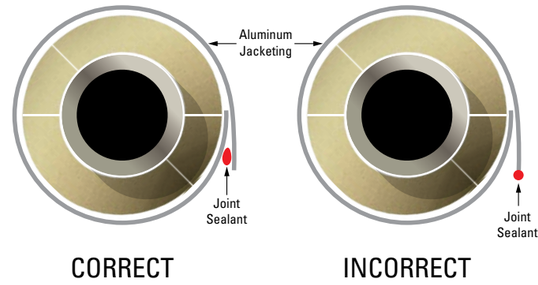
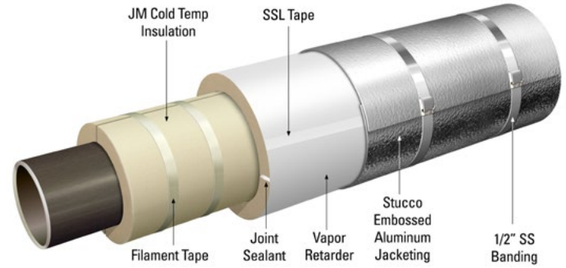


Figure 7



4.3.3 Butyl sealants, such as those described in section 3.8, adhere well to both metal jacketing and the polyfilm moisture barrier.

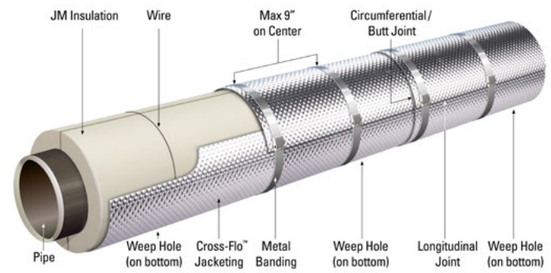
4.3.4 If used, jacketing sealant shall be applied before closing and banding.

4.4 Cross-Flo Multi-directional Drainage Jacketing

4.4.1 Cross-flo jacketing installation guidelines

4.4.1.1 Cross-Flo jacketing can be installed in conjunction with standard jacketing systems and systems designed for drainage.

Figure 8



4.4.1.2 On horizontal and vertical runs, Cross-Flo should be installed per the recommendations in 4.1 and 4.2 for standard metal jacketing installation.

4.4.1.3 It is recommended to use tin snips when field cutting Cross-Flo. If using knives, carbide blades are recommended, ensuring the blades are changed when dulled to maintain a sharp edge.

4.4.1.4 In horizontal applications where Cross-Flo jacketing is installed with other jacketing, it is recommended that the other jacketing types overlap over Cross-Flo at the transition point.

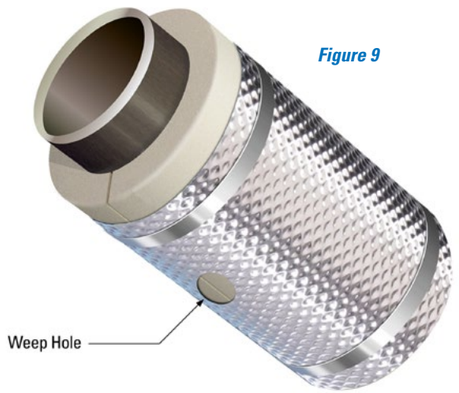
4.4.1.5 The design engineer has final authority on installation in cases where Cross-Flo is used in conjunction with other jacketing.

4.4.1.6 In systems where CUI is not a concern and Cross-Flo is used for aesthetics, installation can follow the guidance of the owner or design engineer.

4.4.2 Weep / drain holes

4.4.2.1 When using Cross-Flo jacketing in a system designed for water draining, weep holes shall be utilized.

Figure 9



4.4.2.2 Weep holes should range from 1/2” - 1” in diameter.

4.4.2.3 Weep holes should be made in the jacketing before installation.

4.4.2.4 On occasions where the weep holes must be cut out of previously installed jacketing, the weep holes should be cut only through the metal jacketing with minimal impact to the insulation material. Ensure the pilot on the drill bit does not extend more than 1/8” into the insulation when creating the weep holes.

4.4.2.5 Weep holes should not be off-center from the 6 o’clock position by more than 50% of the weep hole diameter after installation.

4.4.2.6 Weep holes should be located every 3 to 6 feet of horizontal pipe to ensure best drainage performance.

4.4.2.7 For vertical runs, a weep hole should be added at the low point of the adjacent horizontal run with a connecting elbow to the vertical run.

4.4.2.8 Weep holes can be drilled or cut out of the jacketing, starting from the inside of the jacketing and cutting outward. Be sure to eliminate burrs, fish mouthing, or bends at the weep hole cut to ensure proper drainage performance.

4.4.2.9 Banding shall not cover the weep hole at any location and be installed via the guidelines in 4.5.2.

4.4.2.10 Additional guidance and instructions on installing weep holes can come from the owner, inspector, or specifying engineer.

4.5 Attachment Methods

4.5.1 On cold systems or any system where a continuous vapor retarder is desired, banding shall be used to secure the jacketing. Refer to section 4.1 for details on alternative application methods.

4.5.2 Banding

4.5.2.1 Banding shall be used to attach metal jacketing on all systems operating at below ambient temperatures or where a vapor retarder is desired and is the most common method of attachment, hot or cold.

4.5.2.2 Refer to section 3.4 for material specifications for banding.

4.5.2.3 Refer to section 3.6 for information on tensioners. Refer to the following website for operating instructions for using these tensioners: http://www.miptools.com/Products/SteelPackagingTools/tabid/822/Default.aspx

4.5.2.4 End joints shall be secured with bands and seals centered directly over the joint. This includes joints between two straight sections of jacketing, where straight jacketing meets an elbow, and other circumferential joints.

4.5.2.5 Straight sections of jacketing shall be neatly secured with bands and seals with a maximum spacing of 9” on center. For a 36” jacket section, two bands shall be installed evenly spaced between the bands over the two end joints.

4.5.2.6 In addition to banding at the overlap with straight jacketing, banding used to secure metal elbow covers shall be applied between the raised “fingers”, tightened, and secured using a wing seal. The number of bands required for securing elbow covers varies with size.

4.5.2.7 Refer to Figure 4 and Figure 5 for banding details for straight pipe jacketing and elbow covers.

Figure 10

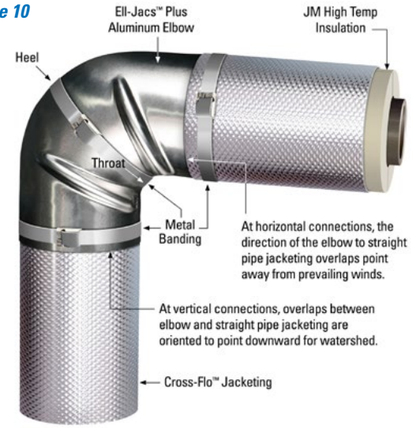
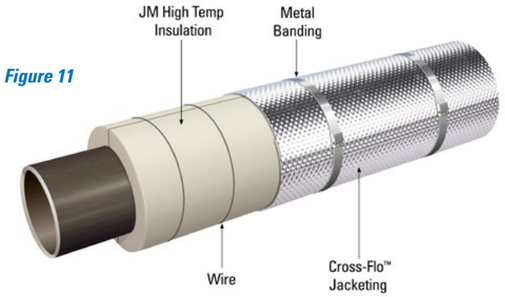


Figure 11



4.5.2.8 Banding and wing seals shall be factory-fabricated Fabstraps (banding with wing seals attached) or field-fabricated. Refer to Figure 1 for details on making and applying Fabstraps.

4.5.2.9 The tension applied to the banding during installation shall be great enough to prevent the banding from sliding from its original position when exposed to normal expansion and contraction. Follow the manufacturer’s instructions for proper use of tensioners and sealers.

4.5.2.10 S-clips or z-clips may be used when needed between vertical pieces of jacketing. These are typically formed by bending banding into three successive 3” long sections to form a Z shape which interfaces between two neighboring pieces of vertical jacketing to hold them in place one on top of the other.

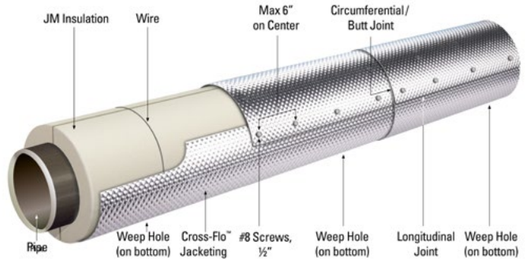
4.5.3 Screws/Fasteners

4.5.3.1 On hot systems or where a continuous vapor retarder is not required, banding, screws, or rivets can be used at the discretion of the contractor, owner, or specification writer.

4.5.3.2 In applications where the pipe is cold (below ambient temperature), banding should be used, unless unavoidable. Refer to section 4.1 and Figure 2 for alternative application methods.

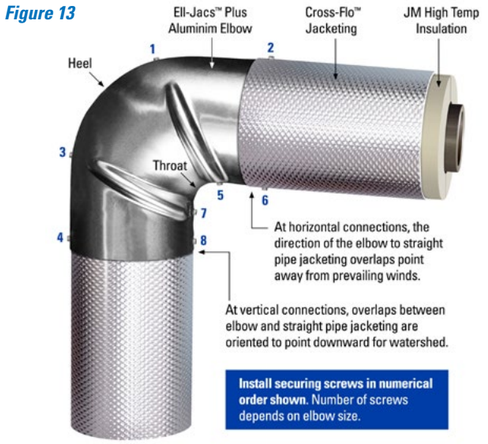
4.5.3.3 When used on above ambient systems, screws shall be installed at a maximum spacing of 6” on center on the longitudinal joint of straight pipe jacketing sections. Refer to Figure 12.

Figure 12



4.5.3.4 Screws shall be installed at a maximum spacing of 3” on center on the longitudinal joint of elbow covers. Refer to Figure 13.

Figure 13



4.5.3.5 For elbow covers, the first screw shall be installed at the center of the elbow heel with subsequent screws installed working outwards from this point toward the ends of the elbow cover. A similar process shall be used to apply the screws to the throat of the elbow cover.

4.5.3.6 Screws shall be installed at joints between elbows and straight pipe jacketing to prevent gaps from forming between the jacketing sections. Refer to Figure 13.

4.5.3.7 Screws may be caulked, or neoprene washers may be used to provide a more weather tight seal.

SECTION 5 – APPENDICES

5.1 Appendix A: Corrosion Resistant Metal Coatings for Underlying Pipe, Vessels, or Equipment

5.1.1 GENERAL NOTE Corrosion of metal pipe, vessels, and equipment under insulation, while not typically caused by the insulation, is still a significant issue that must be considered during the design of any mechanical insulation system. The propensity for corrosion is dependent on many factors including the ambient environment and the operating temperature of the metal. The recommendations below represent the general practice in the industry but are not meant to take the place of proper system design and specification by a qualified design engineer familiar with this type of construction. We recommend that the owner consult such an engineer and have them work closely with the fabricator, the contractor, and JM to help insure a properly designed, installed, and long-lasting insulation system free of corrosion.

5.1.2 Specific Recommendations

5.1.2.1 Stainless Steel Pipe – All 300 series stainless steel pipe shall be coated with a corrosion inhibiting coating system such as a reactive gel or an epoxy primer at 5 mil thickness and an epoxy finish coat at 5 mil thickness if operating in a temperature range between 140°F and 300°F or if in a cycling temperature service where the service temperature is between 140° and 300°F for more than 20% of the time. Consult a coating manufacturer for appropriate coating materials and application methods based on the operating temperature range of the pipe.

5.1.2.2 Carbon Steel Pipe – All carbon steel pipe operating at a service temperature between 32°F and 350°F or in cycling temperature service where the service temperature is between 32°F and 350°F for more than 20% of the time shall be coated with a corrosion inhibiting coating system such as a reactive gel or at a minimum a 5 mil thick epoxy primer. For further corrosion resistance the epoxy primer should be covered with a 5-mil epoxy finish coat. Consult a coating manufacturer for appropriate coating materials and application methods for the operating temperature range of the equipment.

5.2 Appendix B: Details

5.2.1 The following details are referenced in the text of this guideline by their table numbers. However, they are not intended to display the only accepted method of installation but to serve more as an example of commonly used and acceptable practices.

Table 1: Aluminum Jacketing Thickness

Outer Insulation Diameter (in)	Min. Aluminum Jacketing Thickness (in)	
	Rigid Insulation	Non-Rigid Insulation
≤8	0.016	0.016
Over 8 thru 11	0.016	0.020
Over 11 thru 24	0.016	0.024
Over 24 thru 36	0.020	0.032
>36	0.024	0.040

JM recommends that the thickness of aluminum jacketing used vary based on the outer diameter of the insulation system and the strength of the insulation per the requirements of ASTM C1729. This recommended thickness is shown in the table above. When excessive physical abuse is expected, a jacket thicker than that shown in the table may be required. A rigid insulation is defined as having a compressive strength of 15 psi or greater. A non-rigid insulation is defined as having a compressive strength of less than 15 psi.

Table 2: Stainless Steel Jacketing Thickness

Outer Insulation Diameter (in)	Min. Stainless Steel Jacketing Thickness (in)
≤8	0.010
Over 8 thru 11	0.010
Over 11 thru 24	0.010
Over 24 thru 36	0.016
>36	0.020

JM recommends that the thickness of stainless steel jacketing used vary based on the outer diameter of the insulation system per the requirements of ASTM C1767 and the strength of the insulation. This recommended thickness is shown in the table above.

Table 3: 90° Long-Radius Fitting Cover Number

NPS	Nominal Insulation Thickness in mm (in)							
	13	25	38/40	50	63/65	75	88/90	100
	(½)	(1)	(1½)	(2)	(2½)	(3)	(3½)	(4)
½	1*	2	5	8	12	23	15	25
¾	1*	2	5	8	12	23	15	25
1		3	6	11	12	23	15	25
1¼		3	9	11	18	23	15	25
1½		4	9	18	20	24	25	26
2		7	10	18	20	24	25	26
2½		13	16	20	24	25	26	31
3		14	19	22	24	25	26	31
3½		17	21	27	30	33	31	34*
4		17	21	27	30	33	31	34*
4½		28	27	30	38	31	34*	40*
5		28	299	36	38	39	34*	40*
6		32	35	37	39	44	45	57*
7		35	37	39	44	45	57*	52*
8		41	42	43	47	49	52*	53*
9		42	43	47	49	52*	53*	
10		46	50	51*	55*	54*	Q1*	
11		50	51*	55*	56*	Q1*	Q3*	
12		48*	55*	56*	Q1*	Q3*	Q5*	
14				Q1*	Q3*	Q5*	Q7*	
15			Q1*	Q3*	Q5*	Q7*	Q9*	
16				Q5*	Q7*	Q9*		
17			Q5*	Q7*	Q9*			
18				Q9*				

*Available in aluminum only. Not available in stainless steel. Identification numbers beginning with Q are four-piece elbows (Quads).

Table 4: 45° Long-Radius Fitting Cover Number

NPS	21Nominal Insulation Thickness in mm (in)					
	25	38/40	50	63/65	75	88/90
	(1)	(1½)	(2)	(2½)	(3)	(3½)
½	1	3	5		8	
¾	1	3	5		8	
1	2	4	6	7	8	
1¼	2	5	6	7	8	9
1½	3	5	7	8	9	10
2	4	6	7	8	9	10
2½	5	7	8	9	10	11
3	6	7	8	9	10	11
3½	7	8	9	10	11	12
4	7	8	9	10	11	12
4½	8	9	10	11	12	13
5	8	9	10	11	12	13
6	9	10	11	12	13	14
7	10	11	12	13	14	15
8	11	12	13	14	15	16*
9	12	13	14	15	16*	17*
10	13	14	15	16*	17*	18*
11	14	15	16*	17*	18*	19*
12	15	16*	17*	18*	19*	20*
14	16*	17*	18*	19*	20*	21*
15	17*	18*	19*	20*	21*	22*
16	18*	19*	20*	21*	22*	
17	19*	20*	21*	22*		
18	20*	21*	22*			
19	21*	22*				
20	22*					

*Available in aluminum only. Not available in stainless steel.

Table 5: 90° Short-Radius Fitting Cover Number

NPS	Nominal Insulation Thickness in mm (in)							
	13	25	38/40	50	63/65	75	88/90	100
	(½)	(1)	(1½)	(2)	(2½)	(3)	(3½)	(4)
½	1*	2	5	8	12	23	15	25
¾	1*	2	5	8	12	23	15	25
1		3	6	11	12	23	15	25
1¼		3	8	11	12	23	15	25
1½		5	8	12	23	15	25	26
2		6	11	18	23	15	25	26
2½		9	18	23	15	25	26	31
3		10	18	20	24	25	26	31
3½		16	20	24	25	26	31	
4		16	20	24	25	26	31	
4½		22	24	30	33	31		
5		22	24	30	33	31		
6		27	30	33	31			
7		30	33	31				
8		38	39	44				
9		39	44					
10		44						
12		49						

*Available in aluminum only. Not available in stainless steel.

Table 6: Multi-Fit Aluminum Fitting cover

NPS	Nominal Insulation Thickness in mm (in)								
	1	1½	2	2½	3	3½	4	4½	5
½	3	4	5	6	7	8	9	10	11
¾	3	4	5	6	7	8	9	10	11
1	3½	4½	5½	6	7	8	9	10	11
1¼	3½	5	5½	6	7	8	9	10	11
1½	4	5	6	7	8	9	10	11	12
2	4½	5½	6	7	8	9	10	11	12
2½	5	6	7	8	9	10	11	12	
3	5½	6	7	8	9	10	11	12	
3½	6	7	8	9	9	11	12		
4	6	7	8	9	10	11	12		
4½	7	8	9	10	10	12			
5	7	8	9	10	11	12			
6	8	9	10	11	12				
7	9	10	11	12					
8	10	11	12						
9	11	12							
10	12								

Multi-Fit elbow covers are available in aluminum only and in the sizes listed above

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This Installation Guide is intended as a guide only; actual conditions encountered during installation may vary from jobsite to jobsite. By providing this guidance, Johns Manville assumes no responsibility for design, engineering, installation, field workmanship, building code compliance, or job safety. Johns Manville Safety Data Sheets (SDS) are available with specific product safety information. For information on other Johns Manville thermal insulations and systems, call the number listed below or visit JM.com.

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