

1. SCOPE

- 1.1 This guideline covers the installation of Johns Manville Pabco-Childers brand 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 <http://www.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 January 2020. 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 Pabco-Childers 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.

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.

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 $\frac{3}{8}$ " to $\frac{1}{2}$ " in width. A safety hem shall not be used on $\frac{3}{16}$ " 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

METAL JACKETING**ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING**

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 a gold colored 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.

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.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

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 SCREWS/FASTENERS

- 3.7.1 In applications where the pipe temperature is cold (below ambient temperature), rivets, screws, staples, or any other fastener capable of penetrating the underlying vapor retarder shall NOT be used to secure the metal jacketing. These types of fasteners shall only be used on systems operating at above ambient temperature that do not have a vapor retarder.
- 3.7.2 If screws are the attachment method, #8x½" stainless steel screws shall be used.

3.8 JACKETING/FLASHING SEALANTS

- 3.8.1 Jacketing/flushing 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.
- 3.8.2 Flashing sealants shall be used to seal around protrusions, insulation terminations, and jacketing slip joints.
- 3.8.3 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.

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 In applications where the pipe temperature is cold \ (below ambient temperature), rivets, screws, staples or any other fastener capable of penetrating the underlying vapor retarder shall NOT be used to secure the metal jacketing. Bands shall be used in this application. Refer to Figure 1.
- 4.1.7 All fasteners and bands shall be neatly aligned, and overall work must be of high-quality appearance and workmanship.
- 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 2.

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, Figure 5, and Figure 6 for diagrams of longitudinal and butt (circumferential) joints and elbow heel and throat as indicated in this guide.
- 4.2.3 Metal jacketing overlaps shall be a minimum of 2" at butt joints between straight pipe jacketing sections.
- 4.2.4 Metal jacketing overlaps at butt 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 and Figure 5.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

- 4.2.7 On vertical straight pipe, each higher jacketing piece shall overlap the piece below it at butt 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 The heel and throat joints of two-piece elbow covers shall be oriented such that the openings point downward in order to shed water. This means that 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 Where elbows meet vertical straight pipe, the butt 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 butt 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 sealant shall be applied to all longitudinal and circumferential/butt joints in the metal jacketing. This includes both elbows and straight runs of pipe.
- 4.3.2 Jacketing sealant 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 7.
- 4.3.3 Butyl sealants, such as those described in section 3.8, adhere well to both metal jacketing and polyfilm moisture barrier.
- 4.3.4 Jacketing sealant shall be applied before closing and banding.

4.4 ATTACHMENT METHODS

- 4.4.1 On cold systems or any system where a continuous vapor retarder is desired, banding shall be used to secure the jacketing and screws, rivets, or other fasteners capable of penetrating an underlying vapor retarder shall not be used. 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.

4.4.2 Banding

- 4.4.2.1 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.
- 4.4.2.2 Refer to section 3.4 for material specifications for banding.

- 4.4.2.3 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>

- 4.4.2.4 Butt/end joints shall be secured with bands and seals centered directly over joint. This includes joints between two straight sections of jacketing, where straight jacketing meets an elbow, and other circumferential joints.
- 4.4.2.5 Straight sections of jacketing shall be neatly secured with bands and seals with a maximum spacing of 12" on center. For a 36" jacket section, two bands shall be installed evenly spaced between the bands over the two end joints.
- 4.4.2.6 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.
- 4.4.2.7 Refer to Figure 3 and Figure 4 for banding details for straight pipe jacketing and elbow covers, respectively.
- 4.4.2.8 Banding and wing seals shall be factory-fabricated Fabstraps (banding with wing seals attached) or field-fabricated. Refer to Figure 8 for details on making and applying Fabstraps.
- 4.4.2.9 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.
- 4.4.2.10 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.

4.4.3 Screws/Fasteners

- 4.4.3.1 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.
- 4.4.3.2 In applications where the pipe is cold (below ambient temperature), rivets, screws, staples, or any other fastener capable of penetrating the underlying vapor retarder shall NOT be used to secure the metal jacketing.
- 4.4.3.3 Refer to section 3.7 for material specifications for screws.
- 4.4.3.4 Screws shall be installed at a maximum spacing of 6" on center on the longitudinal joint of straight pipe jacketing sections. Refer to Figure 5.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

- 4.4.3.5 Screws shall be installed at a maximum spacing of 3” on center on the longitudinal joint of elbow covers. Refer to Figure 6.
- 4.4.3.6 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. Refer to Figure 6.
- 4.4.3.7 Screws shall be installed at butt joints between elbows and straight pipe jacketing to prevent gaps from forming between the jacketing sections. Refer to Figure 6.
- 4.4.3.8 Screws may be caulked, or neoprene washers may be used to provide a more weather tight seal.

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. 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 300°F or in cycling temperature service where the service temperature is between 32°F and 300°F for more than 20%

5.2 Appendix B: Details

5.2.1 The following details are referenced in the text of this guideline by their Table or Figure numbers. The diagrams included in this section are representative of details used within the industry. 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

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 below. 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.

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

TABLE 2: STAINLESS STEEL JACKETING THICKNESS

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 below. 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.

Outer Insulation Diameter (in)	Min. Aluminum Jacketing Thickness (in)	
	Rigid Insulation	Non-Rigid Insulation
≤8	0.010	0.010
Over 8 thru 11	0.010	0.016
Over 11 thru 24	0.010	0.020
Over 24 thru 36	0.016	0.024
>36	0.020	0.024

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

TABLE 3: 90° LONG-RADIUS FITTING COVER NUMBER

NPS	Nominal Insulation Thickness in mm (in)							
	13 (½)	25 (1)	38/40 (1½)	50 (2)	63/65 (2½)	75 (3)	88/90 (3½)	100 (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	29	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 5: 90° SHORT-RADIUS FITTING COVER NUMBER

NPS	Nominal Insulation Thickness in mm (in)							
	13 (½)	25 (1)	38/40 (1½)	50 (2)	63/65 (2½)	75 (3)	88/90 (3½)	100 (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 4: 45° LONG-RADIUS FITTING COVER NUMBER

NPS	21Nominal Insulation Thickness in mm (in)					
	25 (1)	38/40 (1½)	50 (2)	63/65 (2½)	75 (3)	88/90 (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.

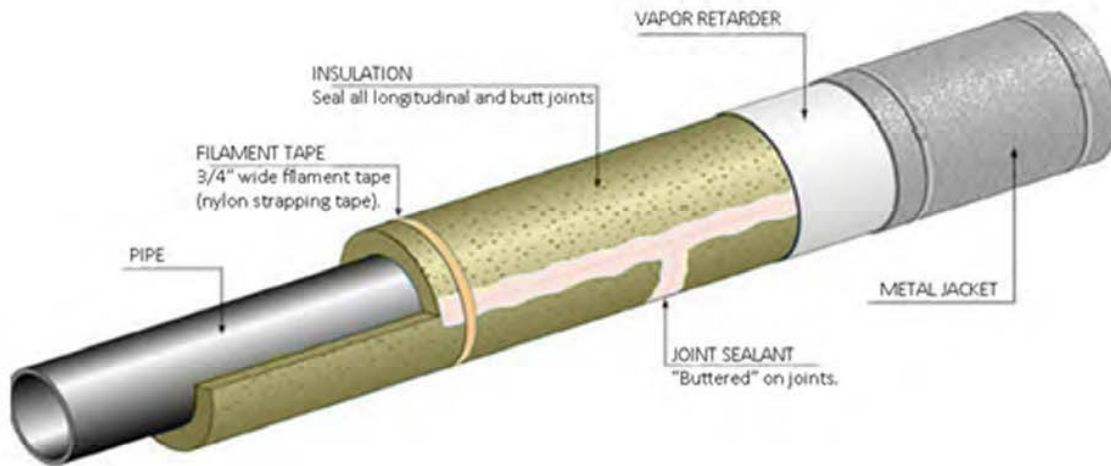
TABLE 6: MULTI-FIT ALUMINUM FITTING COVER

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								

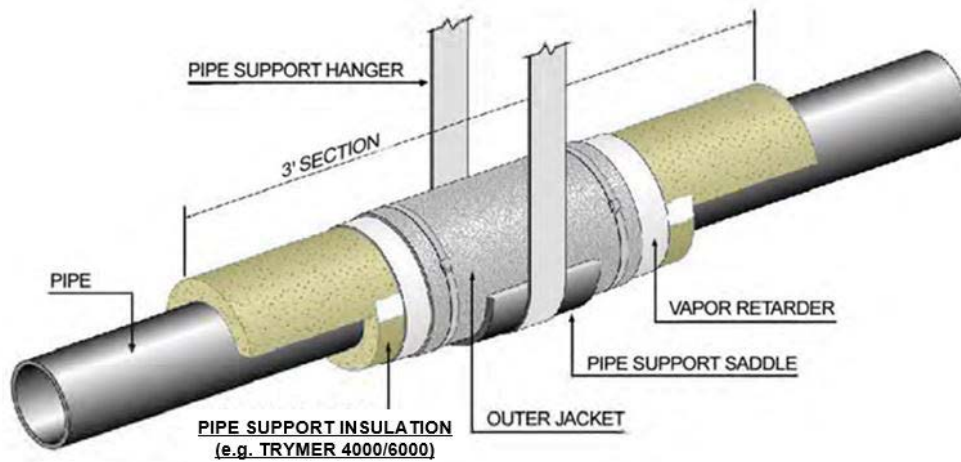
Multi-Fit elbow covers are available in aluminum only and in the sizes listed above

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

FIGURE 1: SINGLE-LAYER COLD INSULATION SYSTEM WITH VAPOR RETARDER AND JACKET**Detail Notes:**

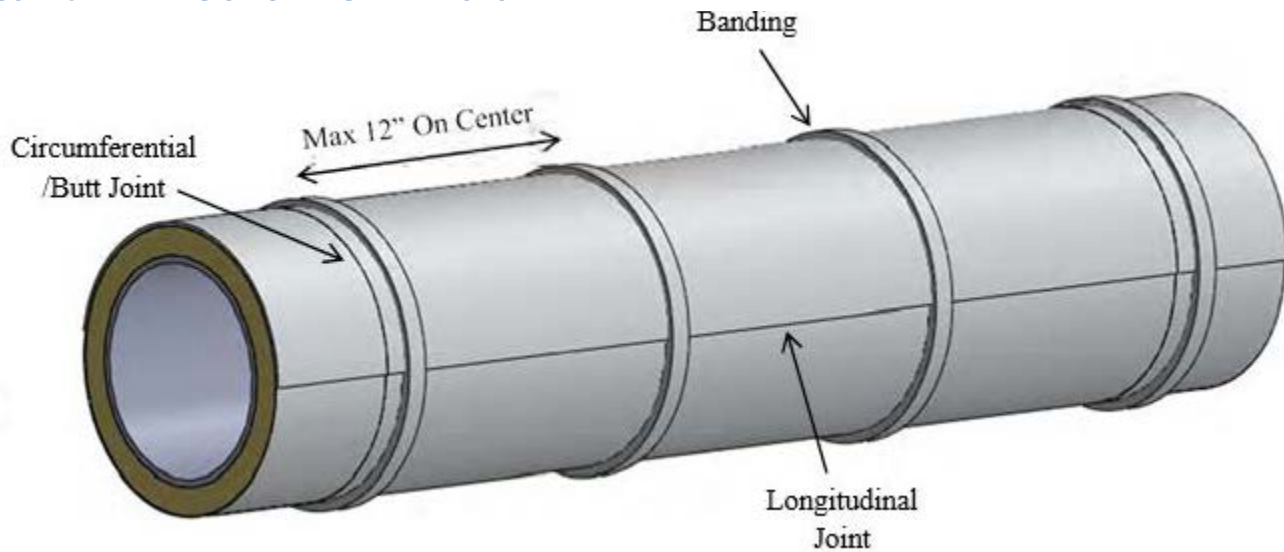
In applications where the pipe is cold (below ambient temperature), rivets, screws, staples or any other fastener capable of penetrating the underlying vapor retarder shall NOT be used to secure the metal jacketing. Banding shall be used for this type of application.

FIGURE 2: SINGLE-LAYER INSULATION SYSTEM THROUGH PIPE HANGER SUPPORT**Detail Notes:**

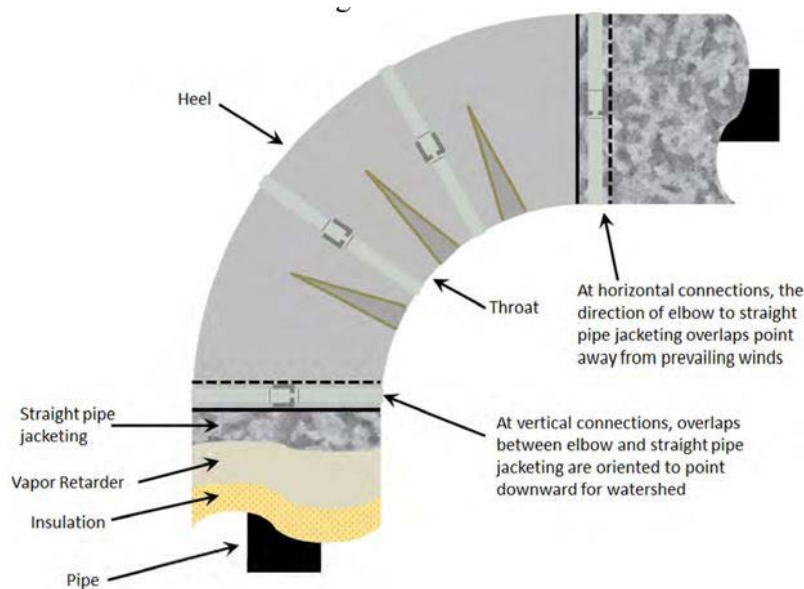
Metal jacketing shall be installed in continuous fashion through the pipe support.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

FIGURE 3: BANDING ON STRAIGHT PIPE JACKET**Detail Notes:**

- On cold systems or any system where a continuous vapor retarder is desired, banding shall be used to secure the jacketing and screws, rivets, or other fasteners capable of penetrating an underlying vapor retarder shall not be used. 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. Refer to Figure 5.
- Butt/end joints shall be secured with bands and seals centered directly over joint. This includes joints between two straight sections of jacketing, where straight jacketing meets an elbow, and other circumferential joints.
- Straight sections of jacketing shall be neatly secured with bands and seals with a maximum spacing of 12" on center. For a 36" jacket section, two bands shall be installed evenly spaced between the bands over the two end joints.

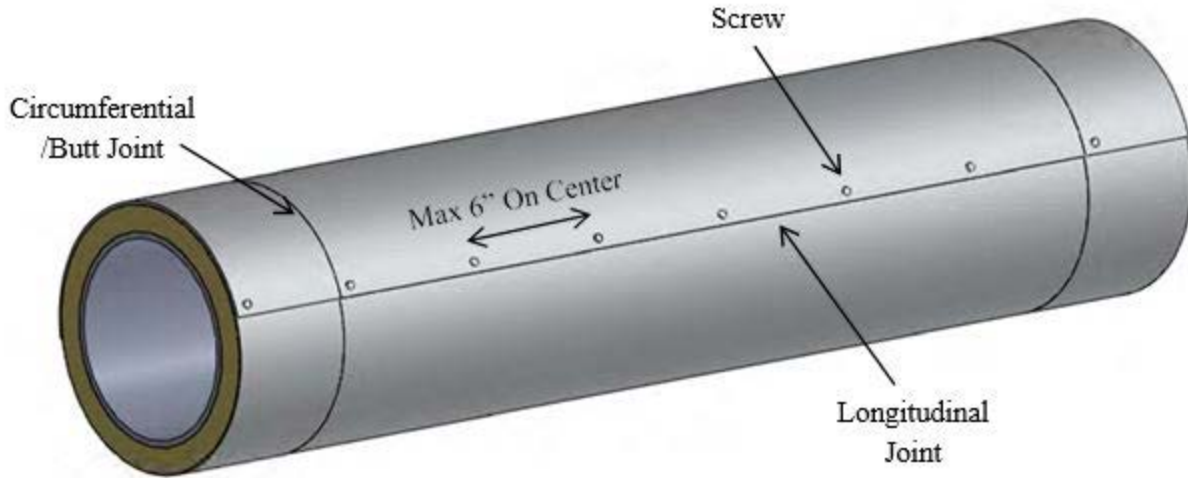
FIGURE 4: BANDING ON ELBOWS**Detail Notes:**

- On cold systems or any system where a continuous vapor retarder is desired, banding shall be used to secure the jacketing and screws, rivets, or other fasteners capable of penetrating an underlying vapor retarder shall not be used. 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. Refer to Figure 5.
- In applications where the pipe is cold (below ambient temperature), rivets, screws, staples, or any other fastener capable of penetrating the underlying vapor retarder shall NOT be used to secure the metal jacketing. These types of fasteners shall only be used on systems operating at above ambient temperature that do not have a vapor retarder.
- Banding used to secure metal elbow covers shall be applied between the raised "fingers", tightened, and secured using a wing seal. Bands shall also be applied over the butt joint overlaps with straight pipe jacketing. The number of bands required for securing elbow covers varies with size.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

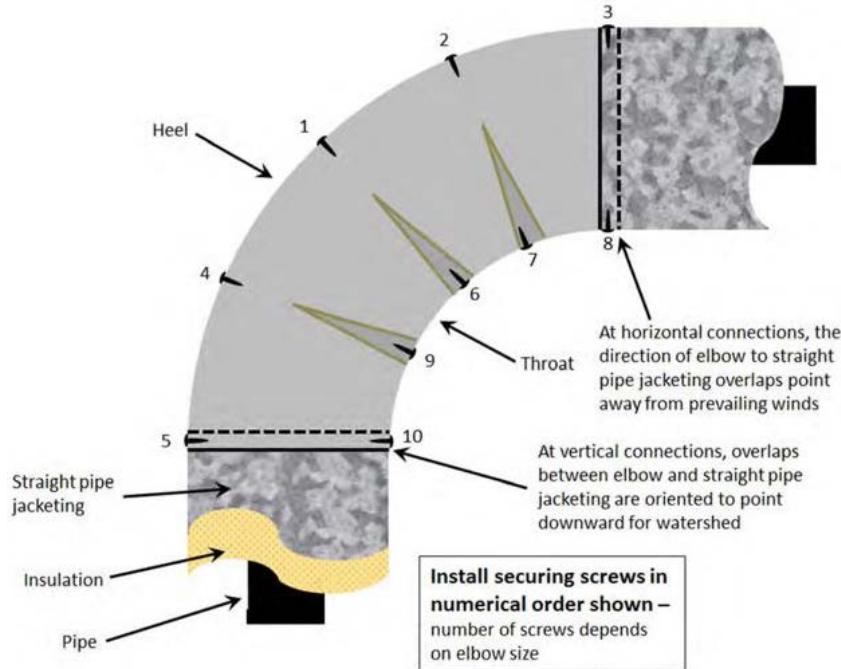
FIGURE 5: SCREWS/FASTENERS ON STRAIGHT PIPE JACKETING



Detail Notes:

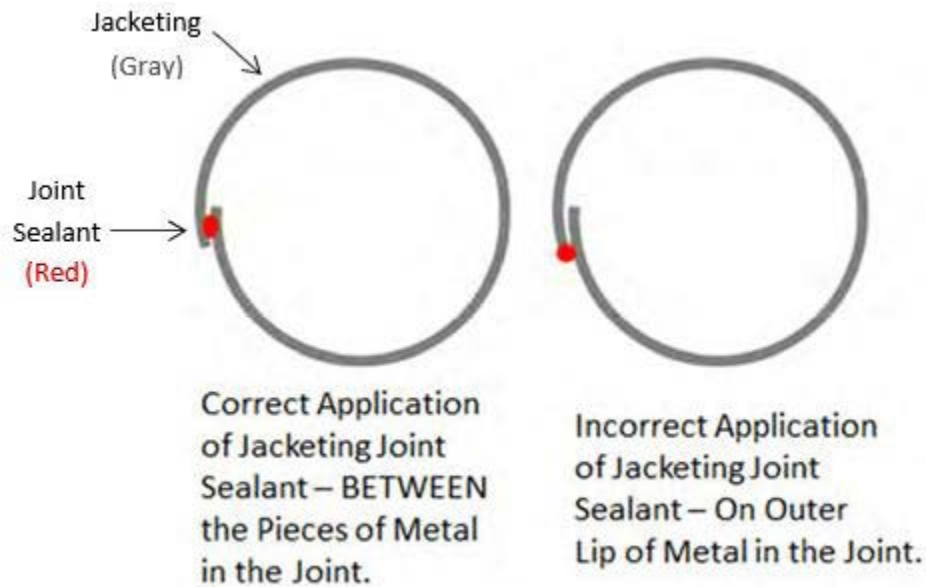
- Screws shall only be used on systems operating at above ambient temperature that do not have a vapor retarder.
- #8x½" stainless steel screws shall be used.
- Screws shall be installed along the longitudinal joints at a maximum spacing of 6" on center for straight pipe jacketing sections.

FIGURE 6: SCREWS/FASTENERS ON ELBOW COVERS (HOT APPLICATIONS ONLY)



Detail Notes:

- Screws shall only be used on systems operating at above ambient temperature that do not have a vapor retarder.
- #8x½" stainless steel screws shall be used.
- Screws shall be installed at a maximum spacing of 3" on center 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. The same process shall be used to apply the screws to the throat of the elbow cover.
- Screws shall be installed at butt joints between elbows and straight pipe jacketing to prevent gaps from forming between the jacketing sections.

FIGURE 7: APPLICATION OF JACKETING JOINT SESSION - CROSS-SECTION VIEW**Detail Notes:**

- Jacketing sealant 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.

METAL JACKETING

ALUMINUM & STAINLESS STEEL METAL JACKETING/CLADDING

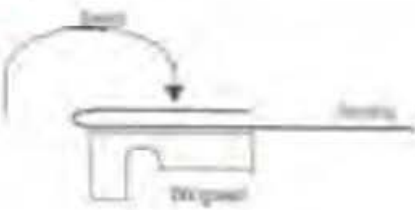
FIGURE 8: ATTACHING BANDING AND WING SEALS: MAKING AND APPLYING FABSTRAPS

STEP 1



Cut your banding to the proper length. With the tips of the wingseal pointed down, thread the banding through the wingseal, extending the end about 1¼" past the seal.

STEP 2



Bend the end of the banding up 180° over the wingseal so that it is flat.

STEP 3



Bend the seal back on the banding about 30°.

Your Fabstrap is complete.

STEP 4



Wrap the Fabstrap around the jacketed insulation, with the wingseal tips pointing up. Thread the banding through the wingseal. Pull the banding tight with a banding tool.

STEP 5



After the banding is pulled tight, bend the banding at the wingseal, up and over 180°.

STEP 6

Push the tips of the wingseal down, then lightly hit them with a hammer to lock the Fabstrap into place. Trim the excess banding or bend over the top.

