



Cold Work Application Guidance

Armaflex[®]

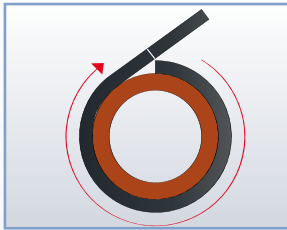
INSULATING COLD LINES WITH LINE TEMPERATURES BETWEEN -50 °C TO -196 °C (-58 °F TO -320 °F)

Whenever Armaflex is to be exposed to these low temperatures the following installation procedures should be observed in addition to all standard Armaflex installation guidelines.

Armacell recommends that only experienced Armaflex installers attempt this procedure. Please contact Armacell directly if you have any concerns or questions regarding the installation procedure.

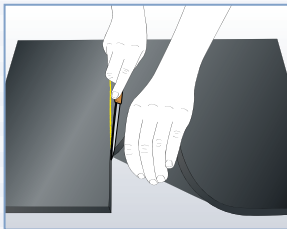
INSTALLING THE 1ST LAYER OF ARMAFLEX

1. Determine the circumference of the pipe, using a strip of the foil laminated Armaflex sheet, where applicable.

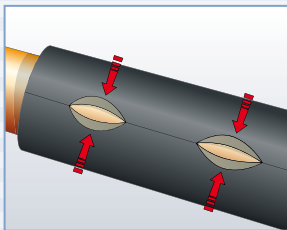


Note: Do not stretch the strip

2. Cut the sheet to the measured circumference. Apply Armaflex Adhesive to the cut surfaces in a thin layer, allow to touch dry.



3. Press together at the ends and then in the middle. Close the entire seam starting from the middle.



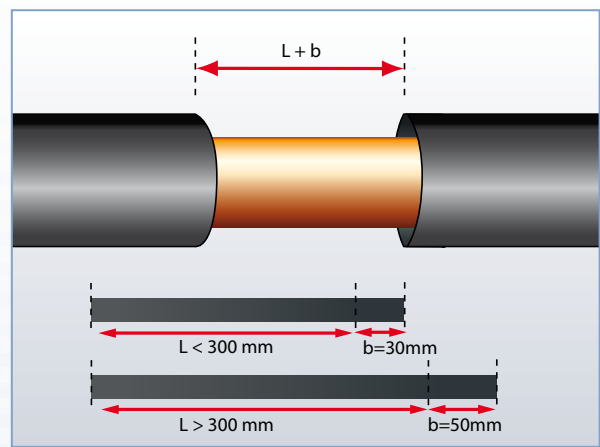
Note: In order to prevent the seam re-opening ensure the adhesive has been fully applied to the edges of the seam and ensure the correct amount of adhesive

has been applied to both surfaces. The touch drying time of the adhesive should also be observed.

4. Wet seal all butt joints by pulling the compressed joint apart and applying a thin even film of adhesive to the two butt joint edges with a small brush.

Note: Fix the Armaflex down to the pipe surface using adhesive at termination points prior to all flanged equipment only! This is only applicable for the first layer of Armaflex.

5. Apply firm and even pressure to the glued joint using the fingers and thumbs to finish.
6. All Armaflex tube/sheet shall be fitted with extra compression to allow for contraction of the piping while in service.



7. On in-fill sections of Armaflex sheet/tube add 30mm or 50mm to L (length of in-fill section).
 - If fill-in section < 300mm length add 30mm.
 - If fill-in section > 300mm length add 50mm.

Important note:

When the line temperature is below -110 °C the inner surface of the first layer of Armaflex sheet or tube will need to have an anti-abrasive layer of glass scrim - aluminium foil applied. The foil can be applied manually, using Armaflex Adhesive.

The foil laminate is fully bonded to the inner surface of the Armaflex insulation. The foil is used as an interface between the surface of the pipe and the inner surface of the Armaflex.

Note: Not required on pipe sizes ½ - 1½”.

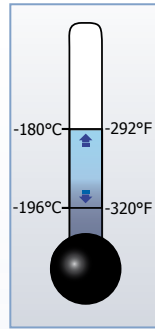
“ All the statements and technical information within this document should be read in conjunction with the customer’s specification. It is the responsibility of the recipient to inform all involved parties about the content of these documents. The described and recommended methods should be strictly followed. If there is a requirement to deviate from our recommendations, please contact us in advance to discuss possible suitable alternatives. Armacell will not be liable for any claim resulting from non-observance of our IMPS specification or any other agreed solutions and from non-observance of the customer’s specification.”

Insulating COLD lines with line temperatures between -50 °C to -196 °C (-58 °F to -320 °F)

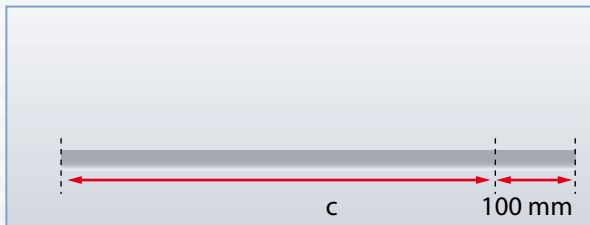
APPLYING GAS TIGHT VAPOUR BARRIER TO THE OUTER SURFACE OF THE 1ST LAYER OF ARMAFLEX

(Multiplex polyester / aluminium foil laminate 50µm thick or equal and approved alternatives).

Only applicable if line temperatures are below -180 °C / -292 °F:

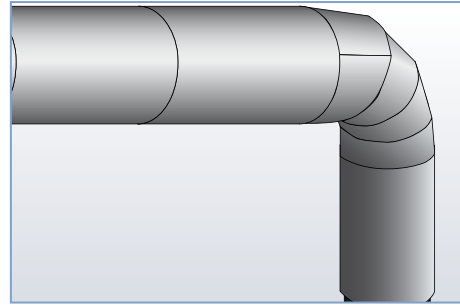


Note: Before applying the vapour barrier, allow 36 hours for the adhesive on the Armaflex sheet to fully dry. Ensuring that **all** adhesive seams and joint details have no defects - check all seams and re-apply the Armaflex Adhesive to the effected areas.

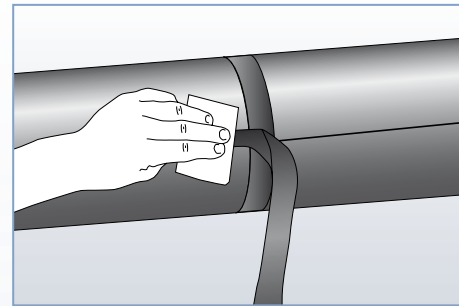


1. Using a measuring tape determine the circumference of the insulated pipe. Take this measurement and add, as a minimum, an additional 100mm to serve as an overlap. For pipes sizes ½ to 1½ add 50% of the circumference measurement.
2. Fix down the foil to the Armaflex. Using a clean paint roller or a plastic card, apply firm pressure to smooth down the foil. Allow the foil to fully bond to the Armaflex.

Note: Ensure there are no large air/solvent pockets present. There will (naturally) be large amounts of creases and crinkles - this will have no negative impact upon the performance of the vapour barrier.



3. When the foil is completely fixed down, glue down the overlap using Armaflex Adhesive. To finish, apply self adhesive foil tape to all seams and joints.



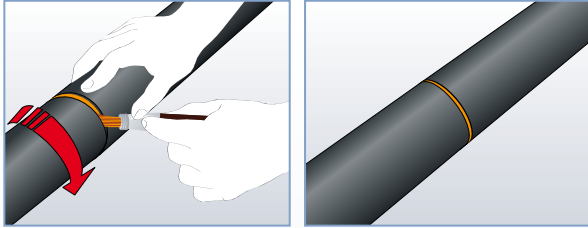
4. Continue along the line covering the entire surface area, each fabricated foil section should be staggered and overlapped on the "butt joints" by a minimum of 100mm.
5. All items of insulated equipment shall be fully (100%) covered with the foil. All attached metal parts shall be fully insulated with an equal thickness of insulation, to that of the main equipment.

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INSULATING 2ND AND ALL MULTILAYERS OF ARMAFLEX

When applying all additional layers of Armaflex, the method of installation is the same as general installation work with Armaflex.

1. On the 2nd and other multi-layers, fix and secure down the insulation at all terminations with Armaflex Adhesive.
2. Ensure the adhesive bonding equals the insulation thickness as a minimum.



3. For the final wet sealing of the tube/sheet, pull the compressed butt joint apart and apply a thin even film of adhesive to the two butt joint edges using a small brush.
4. Apply firm and even pressure to the glued joint using the fingers and thumbs to finish.

Staggering seam

Stagger all seams and joints on all layers; (contraction and compression) butt joints.



Provide an allowance of an additional

- 30mm if section length is < 300mm length
- 50mm if section length is > 300mm length

on all dimensions when cutting from Armaflex sheet or roll.

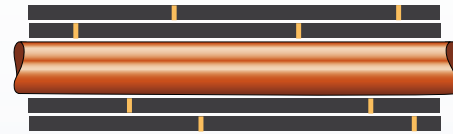
Important: Always measure using a strip of Armaflex of equal thickness to that of the insulation being installed (including any surface finish). Do not stretch the strip.

Multi-layer application on horizontal pipes

Staggering on pipe-work: cross section view



Staggering on pipe-work: longitudinal view

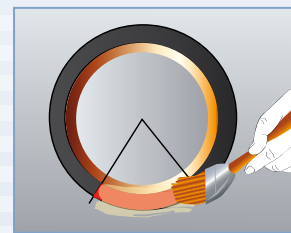


Yellow lines indicate glued seams

Important: Stagger all joints and seams

1. If the outer diameter of the first insulating layer is above 114mm, we recommend that the second layer be made with sheet, since this can be adapted.
2. The 1st layer should never be fixed to the pipe, other than terminations next to a flanged equipment.
3. The end of each Armaflex section of the 2nd layer and all subsequent layers should be glued to the under layer of Armaflex. (see paragraph "wet sealing")

Note: When the outer diameter of 2nd/3rd/4th/5th layers of insulated pipe or equipments is above 500mm, **adhere insulation directly to the preceding layer on the lower 1/4 of the insulated pipe to avoid bellowing/sagging.**



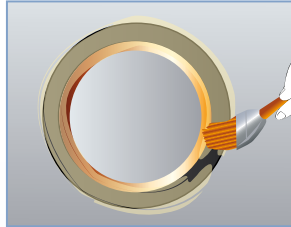
Insulating attached metal parts.

All metallic parts directly attached to the main piping surface, including pipe loading supports and pressure gauge connections, should be fully insulated with the same thickness as the connecting insulation.

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VERTICAL PIPING

When insulating all vertical pipework sections, all-over adhesive coverage must be applied to both the pipework and all Armaflex surface area's on all layers. The adhesive is applied to 100% of the surface area's. Do not spot apply the adhesive.



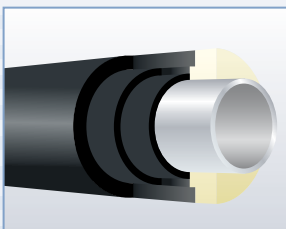
Note: On vertical piping, where applicable (at line temperatures below $-110\text{ }^{\circ}\text{C}$) the use of the anti-abrasive glass scrim aluminium foil laminate IS NOT REQUIRED on the inner surface of the 1st layer of Armaflex.

Vapour sealing insulation to insulated rigid pipe supports - PU foam

It is important, that a vapour tight bonding between the supports and the Armaflex insulation is achieved.

This interface represents a thermal bridge where condensation may occur and adhesion at these points requires special attention:

1. Clean the surface of the support.
2. Apply Armaflex Adhesive on the surfaces which are to be adhered. Allow this first layer of Armaflex Adhesive to dry.
3. Apply a second thin coating of adhesive evenly on both the surface of the support and the Armaflex Adhesive joints. After the adhesive has become touch dry, the joints should be pressed together in a brief but firm action.
4. When adhering both butt joints under pressure per form a "wet-seal" around the joint, ensuring that the Armaflex adhesive has been applied to these surfaces and been allowed to dry in advance.
5. To secure the butt joints apply an overlapping strip of Armaflex using all over adhesive where required.



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YOUR PERSONAL NOTES:

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APPENDIX

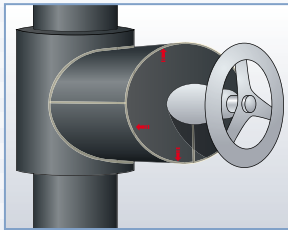
General Information to cryogenic applications

As the boiling point of nitrogen (-196 °C, -320 °F) is lower than that of oxygen (-182.5 °C, -296 °F), there is a risk that liquid oxygen may form on either the pipe surface or the interior core of the insulation. This liquid oxygen can cause a negative reaction when in contact with organic substances such as Armaflex.

Due to this risk it is necessary to prevent oxygen penetration into the insulating material. This penetration occurs through a process whereby the oxygen diffuses and condenses in the core area of the insulation.

Valves, flanges and other metal connections

- Fabricate and install the Armaflex insulation as indicated within the Armaflex Application Manual.
- In addition, all of the air space within the flanged cavities, be packed out with Armaflex and fix in position with Armaflex Adhesive.
- The valve and flange body insulation, should extend over the connecting insulated pipe line by a minimum of 100mm.
- All terminations of insulation around seams and joints, must have an additional vapour seal.
- Metal parts that are connected to the pipe and piping equipment, must be also additionally vapour sealed with the Arma-Chek mastic sealant.



Following this section is Armacell's specification for the "anti-abrasive" glass scrim-aluminium foil – applied to the inner surface of the first layer of the Armaflex insulation at line temperature below -110 °C.

Product specification for the anti-abresive foil

Applied to the inner surface of the first layer of the Armaflex insulation.

Line temperatures from -110 °C and below

Total weight:	approx. 78 gsm	
Tensile strength:	MD	250 N/50 mm
	CD	250 N/50 mm
Elongation	MD	4%
	CD	4%
Aluminium foil Corona treated		
Infrared reflexion	approx. 85%	
WVTR	< 0.03 gsm/24h	

Construction:

	• 12 µm Aluminium foil
	• Glass scrim 5x5 mm
	• 22 gsm Coating

Product specification for the gas tight vapour barrier

Applied to the outer surface of the 1st layer of Armaflex.

Line temperatures from -180 °C and below

Multiplex polyester / aluminium foil
50 until 100µm thickness

Construction:

- 12 µm Polyester film layer
- 25 µm Aluminum foil layer
- 12 µm Polyester film layer

REFERENCE:

This document should be read in conjunction with the Armaflex Application Manual from Armacell.



Armacell GmbH
Robert-Bosch-Straße 10
D-48153 Münster
Germany

Armacell LLC
7600 Oakwood Street Extension
Mebane · NC 27302
USA

Armacell (Guangzhou) Ltd
Guanqiao · Shilou Town
Panyu
China

Tel.: +49 (0) 251/76 03 490

www.armacell.com

Email: imps@armacell.com

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