

A THERMAL AND ACOUSTIC SOLUTION

ArmaSound[®] RD240 & Barrier

Industrial Application Guide
Applications -50°C to 125°C (-58°F to 257°F)

www.armacell.com/energy



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ArmaSound[®]



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Scope

This guide describes the standard methods for application of the ArmaSound RD240 and ArmaSound Barrier components of the ArmaSound Industrial Systems to vessels and industrial process pipework with operating temperatures from -40°C to +125°C (-40°F to 257°F). Instructions for the application of the ArmaFlex and Arma-Chek R components are given in the ArmaFlex and Arma-Chek R Application Guides.

Applications below 40°C (-40°F)

Other Armacell or non-Armacell insulation materials may be used as the first layer(s) of the insulation system for vessels and pipework with operating temperatures below -40°C (-40°F) to ensure that the interface temperature limits of the acoustic layers are not exceeded.

The thickness of the layer(s) of other insulation materials shall depend on the class of system, pipe diameter and operating conditions. Consult Armacell Energy Technical Services at www.Armacell.com/energy or email technical.oilandgas@armacell.com for advice.

Applying Adhesive

IN COMBINATION WITH OTHER HIGH-TEMP INSULATION, eg ARMAGEL

Other insulation materials (eg ArmaGel) may be used as the first layer(s) of the insulation system for pipework with operating temperatures from 125 to 250°C (257 to 482°F) to ensure that the interface temperature limits of the other layers are not exceeded.

The thickness of these other layers shall depend on the class of system, pipe diameter and operating conditions. Consult Armacell Energy Technical Services at www.Armacell.com/energy or email technical.oilandgas@armacell.com for advice.

Products

- ArmaFlex Industrial (FEF)
- Arma-Chek D tape
- ArmaSound RD240
- ArmaSound Barrier
- Arma-Chek R (2mm acoustic grade only)
- ArmaGel
- ArmaFlex Adhesives
- ArmaFlex Cleaner
- Arma-Chek Mastic



Data sheets available at:
www.armacell.com/energy

Equipment / Tools



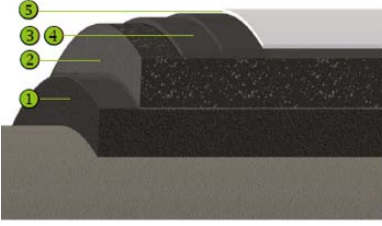
- Knives, examples:
 - 75 mm [3 in.] ceramic knife
 - 75, 150, 225 mm [3, 6, 9 in.] steel knives [not serrated] + sharpener
- Craft knife
- Tin snips
- Silver marker pen
- Square
- Ruler / tape measure
- Glue brush / Gluemaster dispenser
- Glue roller / tray
- Mastic gun
- Band tensioning tool
- Dividers

Technical Support

ArmaSound Industrial Systems are constructed from multiple layers and various thicknesses of different materials, combined to achieve the required acoustic performance specified for Systems A to D.

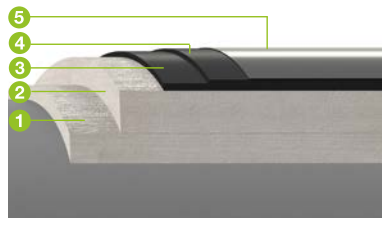
Examples of acoustic system C (ISO 15665) are shown below. For exact layer configurations and thicknesses refer to the ArmaSound Industrial Systems brochure, the project specifications and guidance from Armacell Energy.

SYSTEM FEF (R) | CLASS C



1	Armaflex Industrial	25 mm
2	ArmaSound RD240	25 mm
3	ArmaSound Barrier E	3 mm
4	ArmaSound Barrier E	2 mm
5	Arma-Chek R	2 mm

CLASS C | AG (MC) - CLASS C2








1	ArmaGel	20 mm
2	ArmaGel	20 mm
3	ArmaSound Barrier E	4 mm
4	ArmaSound Barrier E	2 mm
5	Aluminium	0.5 mm

Application Conditions

Apply only when conditions are suitable. If conditions cannot be controlled, consult Armacell Energy for advice.

ArmaSound RD240 shall be kept fully dry at all times.

				
air temp. 5°C to 35°C (41°F to 95°F)	surface temp. 5°C to 35°C (41°F to 95°F)	humidity < 80% RH. 3°C (5°F) > dewpoint	shade	shelter from rain

Adhesive Curing Conditions

Allow adequate time for drying/curing. Shelter from adverse weather until final protective jacket/cladding has been applied and adhesives/mastics are dry/cured. Temperature shall not exceed 35°C for first 6-8 hours of adhesive curing unless otherwise approved by Armacell Energy. Do not seal tightly in polythene, or apply vapour barrier or Arma-Chek R jacket for 24 hours. If conditions cannot be maintained, contact Armacell Energy for advice.



Surface Preparation

Pipe/vessel insulation material surfaces must be clean, dry and free from rust, oil, contamination or damage. ArmaFlex Cleaner may be used on the pipe to assist in oil/grease removal, subject to client approval.

If any dust or surface contamination is present on the ArmaSound, it shall be removed prior to application of adhesive using a dry cloth. Do not use ArmaFlex Cleaner on ArmaSound RD240. The use of ArmaFlex Cleaner on ArmaSound Barrier is normally unnecessary, Clean water is sufficient if required.



Adhesive Selection

Use the correct adhesive: ArmaFlex HT625 adhesive may be used with all ArmaFlex/ArmaSound RD240 & Acoustic Barrier types, but ArmaFlex 520 adhesive may only be used with LT/ArmaFlex Industrial.

ArmaFlex HT625 Adhesive



- ✓ Arma-Chek R
- ✓ LT/ArmaFlex Industrial
- ✓ HT/ArmaFlex Industrial
- ✓ HT/ArmaFlex Industrial IMO
- ✓ Arma-Chek RD240
- ✓ Arma-Chek Barrier

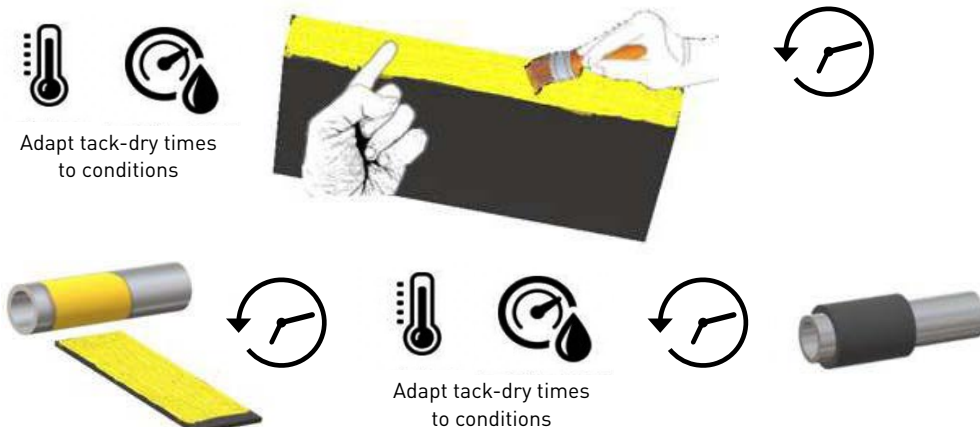
ArmaFlex 520 Adhesive



- ✓ Arma-Chek R
- ✓ LT/ArmaFlex Industrial
- ✗ HT/ArmaFlex Industrial
- ✗ HT/ArmaFlex Industrial IMO
- ✓ Arma-Chek RD240
- ✓ Arma-Chek Barrier

Applying Adhesive

ArmaFlex Adhesive shall be stirred well before use. To adhere ArmaFlex to itself or another surface, brush or roll a thin, even, film of ArmaFlex Adhesive to both contacting surfaces. Allow the adhesive to become 'tack-dry' then apply firm and even pressure to the ArmaFlex surface(s). The term 'tack-dry' means that adhesive is sufficiently dry that it will not stick to a finger nail when touched. The time taken for the adhesive to become tack dry will depend on the ambient temperature and humidity and shall be rechecked at regular intervals during the working day.

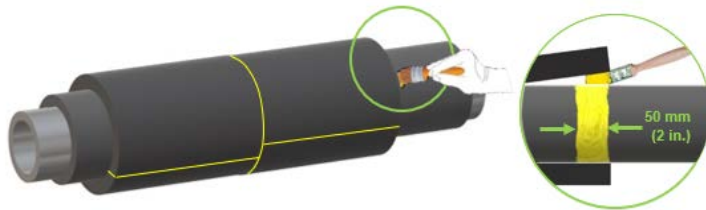


The 'open time' time during which a bond can be made is also limited by temperature and humidity. These time periods must be adapted as weather conditions change.

Applying Adhesive

MINIMUM ADHESIVE REQUIREMENTS

When the insulation layer is not fixed to the underlying insulation surface using all-over adhesive coverage, a 50mm (2 in.) strip of adhesive shall be applied between and to both insulation layers using a small glue brush to “wet” seal the two contacting surfaces. This shall be performed at one end of every section of insulation applied. This creates a fixed point so that a compressed joint can be achieved at the other end.

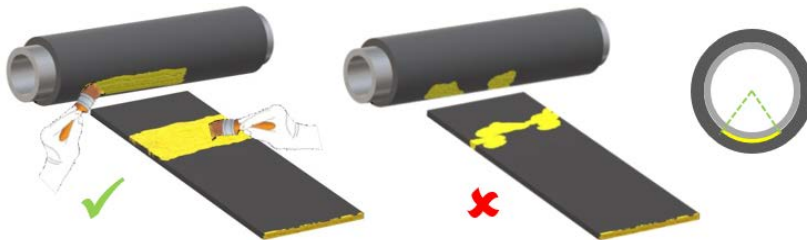


Apply adhesive between pipe and ArmaSound to create 50mm (2in.) strip

Applying Adhesive

PARTIAL ADHESIVE COVERAGE

The term ‘partial adhesive coverage’ is defined as the application of 100% adhesive fixing for a specified limited contact area such as on the bottom quarter of a pipe for example. Spot adhesion is not permitted.

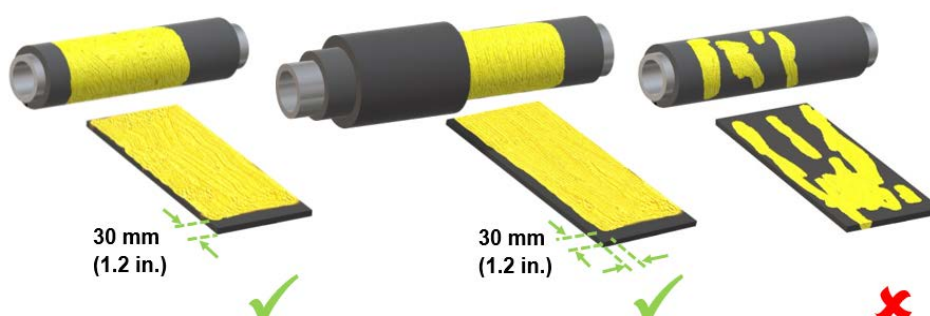


Applying Adhesive

ALL-OVER ADHESIVE COVERAGE

The term “all-over adhesive” coverage is defined as the application of 100% adhesive coverage over both contact surfaces where the ArmaSound RD240 is glued to the object or previous layer with its entire surface.

NOTE: a 30mm (1.2 in.) strip without adhesive is required where joints will be installed under compression. Spot adhesion is not permitted.

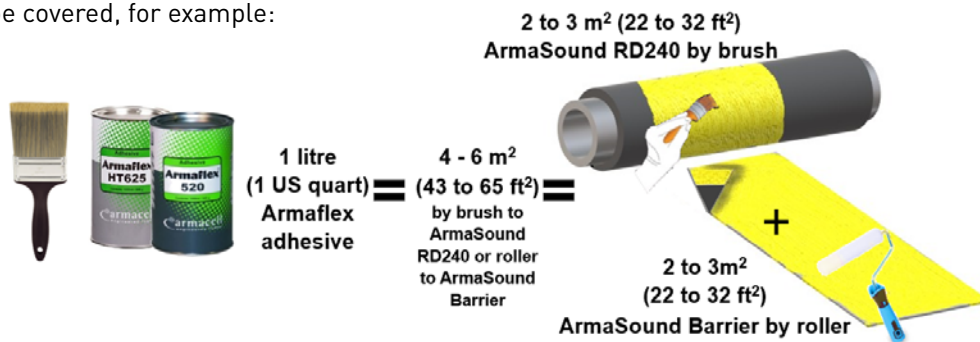


Adhesive Coverage

1 litre (1 US quart) of ArmaFlex Adhesive 520 or HT625 will cover between 3 and 8m² (32 to 86 ft²) of each bonded surface, depending on the type of surface and application method.

	Adhesive coverage m ² / litre [ft ² / quart]	
	Brush/Gluemaster	Roller/spreader
ArmaFlex	6-8 (65-86)	4-6 (43-65)
ArmaSound RD240	4-6 (43-65)	3-4 (32-43)
ArmaSound Barrier	5-7 (54-75)	4-6 (43-65)

The total quantity of adhesive required must allow for both surfaces to be covered, for example:



ArmaFlex Adhesive Waiting Times

ArmaFlex Adhesive Waiting Times before next ArmaFlex layer, Arma-Chek R, Acoustic Barrier or Arma-Chek Mastic is applied

ArmaFlex Adhesive Waiting Time (During Installation of Single & Multi-layering Materials & Cladding)				
ArmaFlex / ArmaSound RD 240		Arma-Chek R / Acoustic Barrier / Other Impermeable Materials & Rigid Claddings		Arma-Chek Mastic
Adhesive Method:	NEW Wait Time: (Between Layers)	Adhesive Method:	NEW Wait Time: (Between Layers)	NEW Wait Time: (Between Layers)
Seams & Wet Seal Joints (All Layers) Standard Installation	1 Hour	Overlaps Only	3 Hours	4 Hours
Seams & Wet Seal Joints Including (Partial ¼ - ⅓) Adhesive Fixing	12 Hours or 1 Hour Using D-Tape Method	Overlaps Including (Partial ¼ - ⅓) Adhesive Fixing	24 Hours	4 Hours
Seams & Wet Seal joints Including (All Over Adhesive) Fixing	12 Hours or 1 Hour Using D-Tape Method	Overlaps Including (All Over Adhesive) Fixing	24 Hours	4 Hours

Application of ArmaSound RD240

ELASTOMERIC FOAM ACOUSTIC INSULATION



ArmaSound RD240 is generally applied only onto an ArmaFlex or other insulation layer, never directly to the pipe, except when used in removable boxes.



The ArmaSound RD240 shall be applied as a continuous surface over the previous layer, so that no metal parts/fittings are left uncovered. This ensures that there are no gaps which could cause noise leakage.

Application of ArmaSound RD240 to Small Diameter Piping

MINIMUM DIAMETER FOR APPLICATION OF ARMASOUND RD240 SHEET

Thinner ArmaSound RD240 sheet is easier to wrap around small diameters than 25mm thick ArmaSound RD240 sheet. Installation is easiest when the temperature > 10°C (50°F).

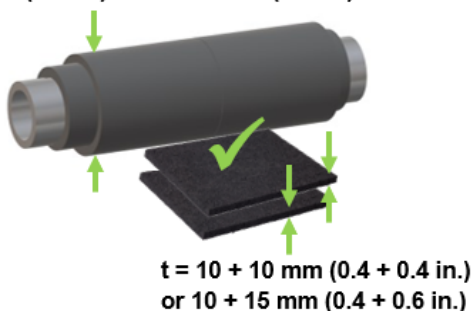
To reduce joint stresses, do not exceed the maximum sheet thickness indicated for each pipe size.

ArmaSound RD240 shall only be applied onto an ArmaFlex surface of overall diameter > 72mm (2.8 in.). If the overall surface diameter < 72 mm (2.8 in.) then it must be built up with additional layer(s) of ArmaFlex before the ArmaSound RD240 can be applied. The ArmaFlex may be applied as tubular product or sheet, as per the ArmaFlex Application Guide.

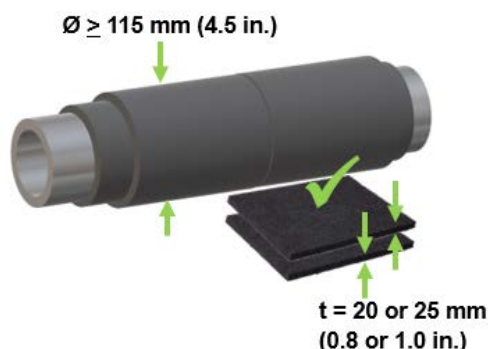


Application of ArmaSound RD240 to Insulated Diameters > 72 mm (2.8 in.) or > 115mm (4.5 in.)

72 mm (2.8 in.) < \varnothing < 115 mm (4.5 in.)



If the overall ArmaFlex surface diameter > 72 mm (2.8 in.) but \leq 115mm (4.5 in.) then the ArmaSound RD240 sheet shall be applied as layers of 10 + 10 mm (0.4 + 0.4 in.) or 10 + 15 mm (0.4 + 0.6 in.).



When the diameter of the ArmaFlex surface > 115mm (4.5 in.) then ArmaSound RD240 may be applied in 20 or 25 mm (0.8 or 1.0 in.) sheets.

Measuring Circumference

Measure circumference with ArmaSound RD240 strip (cut from the sheet which is to be applied), not a tape measure. Do not stretch the ArmaSound RD240 sheet to fit around the insulated pipe.

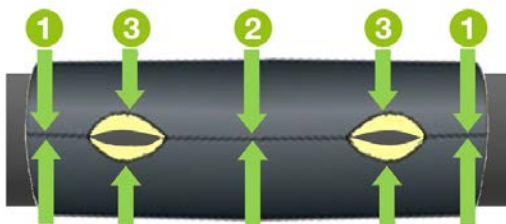
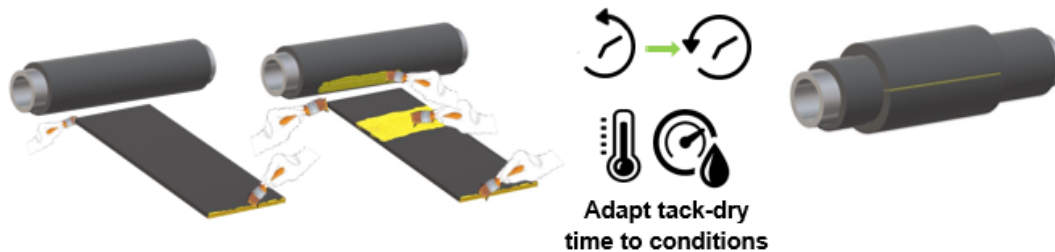
ArmaSound RD240 shall never be installed under tension.



Adhering Longitudinal Seams

ARMASOUND RD240 SHEET WITH MINIMUM OR PARTIAL ADHESIVE COVERAGE

If the ArmaSound RD240 is fixed to the underlying insulation surface using minimum or partial adhesive coverage, then apply the adhesive to the longitudinal seam only and allow to become tack dry before joining the seam.



- 1) Press together ends of seam.
- 2) Press together the middle of seam.
- 3) Press to close entire seam.

The joint must not be stretched.

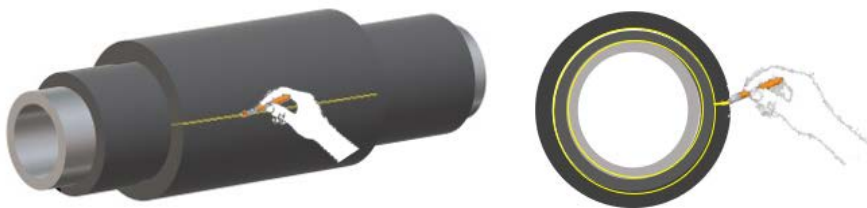
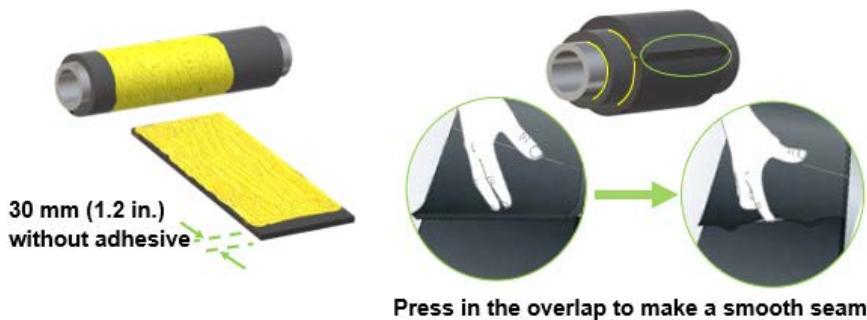
Adhering Longitudinal Seams

ARMASOUND RD240 SHEET WITH ALL-OVER ADHESIVE COVERAGE

When ArmaSound RD240 sheet is all-over adhered to the insulated pipe, then extra material must be installed to create compression in the longitudinal seam joint. Cut the ArmaSound RD240 sheet to a length 5-10 mm (0.2 – 0.4 in.) longer than the circumference, so that an overlap is created.



Adhere the ArmaSound RD240 to the pipe but leave a border of 30 mm (1.2 in.) without adhesive so that the overlap will not stick to the seam edge underneath. Press in the overlapped edge to create a compressed longitudinal seam joint.



Finish the seam joint by pulling apart the seam slightly and applying adhesive into the joint using a small glue brush, without waiting for the adhesive to become tacky.

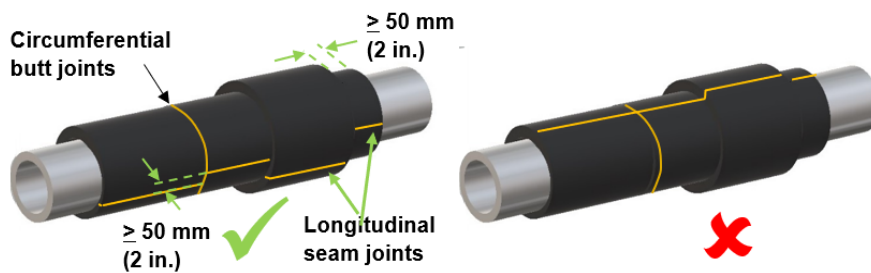
Staggering Joints

ARMAFLEX, ARMASOUND RD240

All ArmaFlex and ArmaSound RD240 longitudinal seams and circumferential 'butt' joints shall be staggered by a minimum 50mm (2 in.) and secured firmly with ArmaFlex Adhesive.

Subsequent layers shall be installed in the same way as the previous layer.

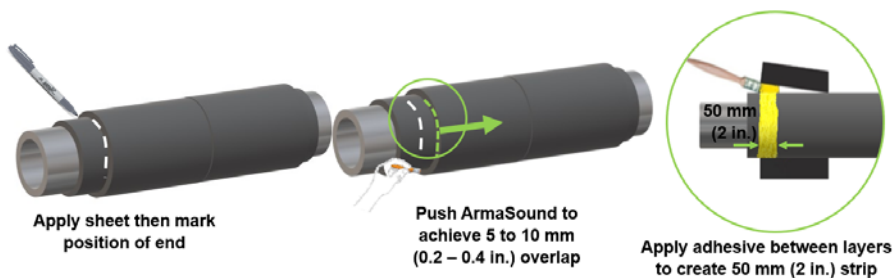
Longitudinal seam joints shall be positioned to the side to shed water.



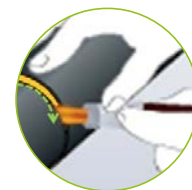
Adhering Circumferential Joints

ARMASOUND RD240 SHEET WITH STANDARD ADHESIVE COVERAGE FIXING

Apply the ArmaSound RD240 sheet and adhere the longitudinal joint. Mark the end of the underlying surface and then push the jointed tube towards the previously applied section by 5 to 10 mm (0.2 – 0.4 in.). Secure the inner surface of the Arma Sound RD240 section to the surface of the previous system layer with a 50mm (2 in.) strip of ArmaFlex Adhesive, applied by inserting a glue brush between the layers. Allow to cure so that will not slip. Check that 5 to 10 mm (0.2 – 0.4 in.) still exists between the new section and the mark on the underlying surface.



Apply adhesive into the circumferential joint using a small glue brush to "wet" seal the two sections of ArmaSound RD240. There is no need to let the adhesive become tack dry, but apply pressure to ensure that the joint is closed.

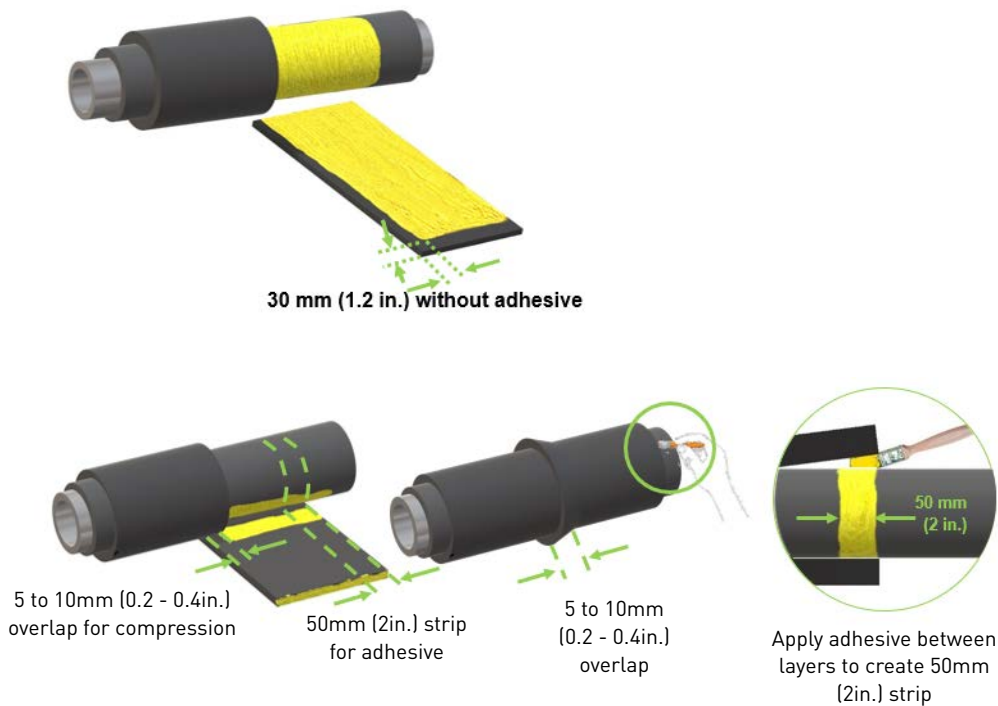


Adhering Circumferential Joints

ARMASOUND RD240 SHEET WITH PARTIAL OR ALL-OVER ADHESIVE COVERAGE FIXING

Circumferential 'butt' joints shall be applied with 5 to 10 mm (0.2 – 0.4 in.) of linear compression, with no gaps.

Apply adhesive to the insulated pipe surface and to the ArmaSound RD240 but leave a 30 mm (1.2 in.) strip of ArmaSound RD240 without adhesive at the overlap so that it does not stick to the ArmaSound RD240 edge underneath.



When tack dry, apply the ArmaSound RD240 to the underlying insulation, ensuring that one end overlaps the previously installed section by 5 to 10 mm (0.2 – 0.4 in.). This extra material will be used to create compression in the joint.



Press in the overlapped edge to create a tight-butted joint. This joint will be compressed. Apply adhesive into the joint using a small glue brush to "wet" seal the two sections of ArmaSound RD240. There is no need to let the adhesive become tack dry, but apply pressure to ensure that the joint is closed.

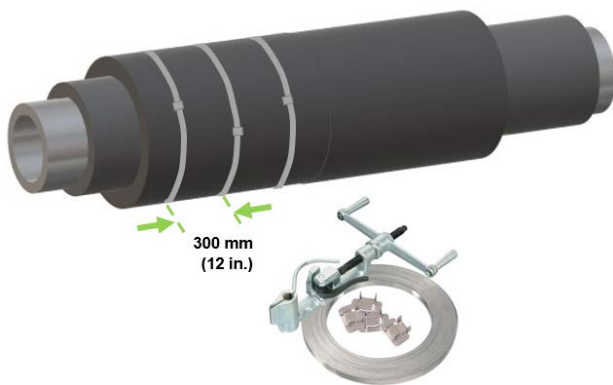
Stainless Steel Banding / Mechanical Securement

REQUIRED FOR ACOUSTIC SYSTEM B ONLY

For system B only, the final layer of ArmaSound RD240 shall always be secured with 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres.

For small-diameter applications (pipe sizes < 3" nominal size) insulation stainless steel binding wire should be used instead of bands, and installed at 150mm (6 in.) centres. Do not overtighten the wire.

Other systems do not require bands unless left unfinished for an extended period during construction.



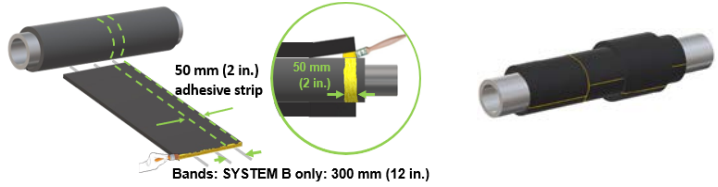
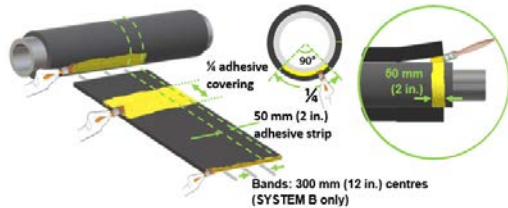
System B: final layer of ArmaSound RD240 secured with bands

Standard Application Method, ArmaSound RD240


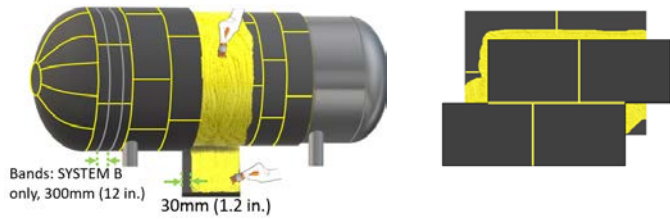
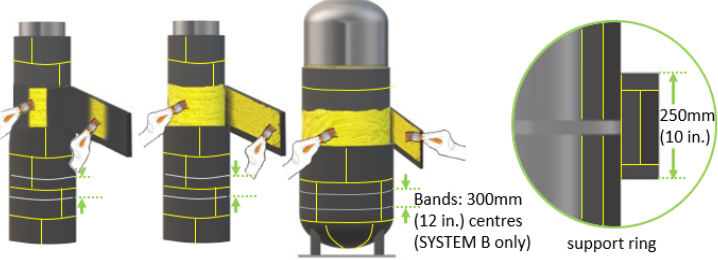
ALL LAYERS TO BE APPLIED USING SAME METHOD AS FIRST LAYER

Wait between 1 - 12 hours from application of previous layer of ArmaFlex or ArmaSound RD240 before applying layer of ArmaSound RD240, unless using ArmaFlex D tape to reduce wait time to 1 hour.

STANDARD APPLICATION METHOD, ARMASOUND RD240

<p>Horizontal Piping $\varnothing \leq 508$ mm (20" NB)</p> <ul style="list-style-type: none"> - Adhesive strip at one edge - Adhered seams/joints - Staggered joints 	
<p>Horizontal Piping 508 mm (20" NB) < $\varnothing \leq 914$ mm (36" NB)</p> <ul style="list-style-type: none"> - Adhesive strip at one edge - Partial adhesive covering on bottom 1/4 - Adhered seams/joints - Staggered joints 	

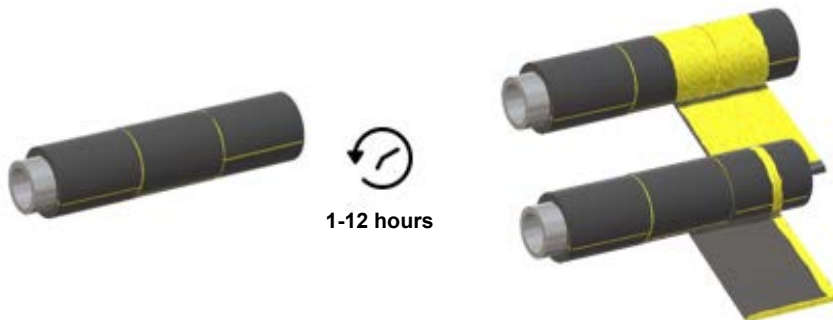
SYSTEM B ONLY: final layer shall be secured with 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres. ArmaSound RD240 in other systems does not require bands unless left unfinished for an extended period

<p>Horizontal Piping $\varnothing > 914$ mm (36" NB)</p> <ul style="list-style-type: none"> - All-over adhesive covering - Adhered seams/joints - Staggered joints 	
<p>Horizontal Vessels/Equipment, all \varnothing</p> <ul style="list-style-type: none"> - All-over adhesive covering - Adhered seams/joints - Staggered joints 	
<p>Vertical Piping $\varnothing \leq 610$ mm (24" NB) partial 1/3 adhesive fixing down center of each insulation section applied. $\varnothing > 610$ mm (24" NB) – All-over adhesive covering. Vertical Vessels/Equipment, all \varnothing</p> <ul style="list-style-type: none"> - All-over adhesive covering - Adhered seams/joints - Staggered joints - Insulation support rings are recommended, with an acoustic insulation cover to prevent noise leakage; insulation build up to be as on pipe/vessel. 	

SYSTEM B ONLY: final layer shall be secured with 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres. ArmaSound RD240 in other systems does not require bands unless left unfinished for an extended period

Multi-Layer Wait-Time

Wait either 1 or 12 hours minimum before applying the next layer of ArmaSound RD240 or ArmaSound Barrier. The wait time can be reduced to 1 hour for partial and all over adhesive coverage fixing when applying ArmaSound RD240 by using the “D-Tape Time Reduction Method”.



Multi-Layer Wait-Time Reduction

D-TAPE WAIT TIME REDUCTION METHOD

The wait time before applying the next layer of ArmaSound RD240 can be reduced to 1 hour for insulated pipe sizes up to (20" NB) for sizes above 20" with partial or all over adhesive coverage if the joints of the previous insulation layer are covered with Arma-Chek D Tape as illustrated below. The D Tape may be applied after 1 hour. D Tape is a specially developed breathable tape: do not use alternative self-adhesive tapes.



Tape Wait-Time Reduction Method

Apply adhesive to the ArmaFlex/ArmaSound RD240 only, either side of the seam/joint. Keep adhesive at least 10mm (0.39 in.) away from seam/joint. While the adhesive is still wet, apply the Arma-Chek D Tape.



Apply D tape onto wet ArmaFlex adhesive

Keep adhesive 10mm (0.39in.) away from seam/joint

Application of ArmaSound Barrier

HIGH-PERFORMANCE MASS-LOADED BARRIER

ArmaSound Barrier is typically applied to an ArmaSound RD240 surface, never directly to the pipe/vessel surface.



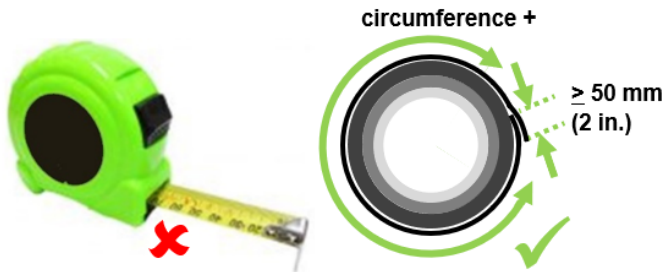
Direction of Application

When applying ArmaSound Barrier sheet, ensure that the natural curvature of the rolled sheet follows the curvature of the insulated pipe.



Measuring Circumference

Measure circumference with ArmaSound Barrier strip (cut from the sheet which is to be applied), **not** tape measure.



Staggered Joints

ARMASOUND BARRIER

All ArmaSound Barrier overlapped joints shall be staggered by a minimum 50mm (2 in.) [see exceptions for overlaps on fittings].

Subsequent layers shall be installed in the same way as the previous layer.

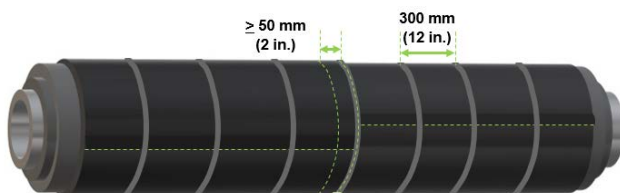


ArmaSound Barrier Overlapping Joints – Horizontal / Vertical Applications

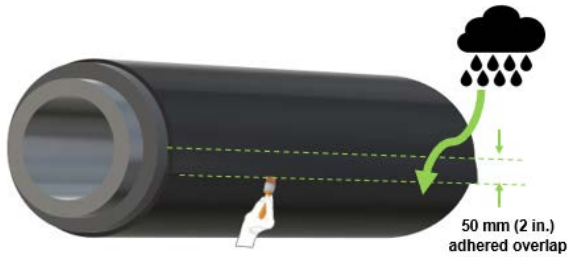
OVERLAPPING AND SECURING ARMASOUND BARRIER JOINTS

All ArmaSound Barrier seams/joints shall be overlapped by a minimum 50mm (2 in.) [see exceptions for overlaps on fittings] and secured firmly with ArmaFlex Adhesive, and with 19mm (0.75 in. wide) x 0.5mm thick stainless steel bands and clips at 300mm (12 in.) centres. **Note: Where two layers of barrier are installed (system D) stainless steel bands are only required on the 2nd barrier layer applicable for horizontal piping only.**

Where ArmaSound Barrier is used with non- Armacell insulation materials, the use of ArmaFlex Adhesive is optional. **Note: To help mount the barrier during installation before the final securement with bands and “S-clips , ArmaFlex adhesive can be used during the application process – it is not mandatory to use adhesive to prevent sagging or slippage.**



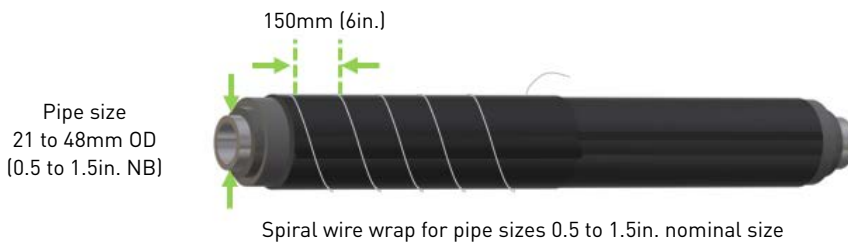
Overlapping ArmaSound Barrier seams shall be positioned to the side to shed water.



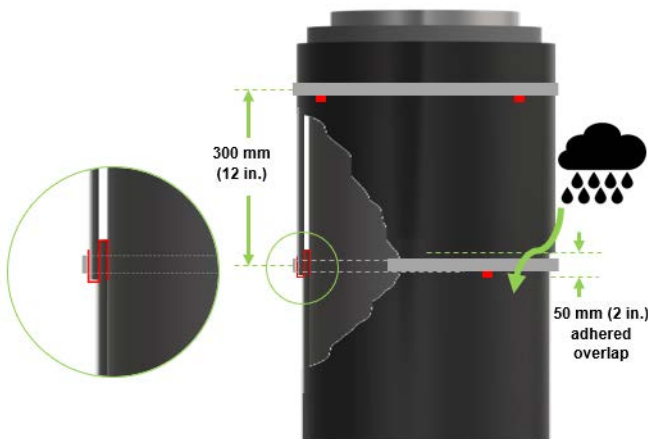
ArmaSound Barrier shall be applied as a continuous surface over the previous layer, so that no insulated parts/fittings surfaces are left uncovered. This ensures that there are no gaps which could cause noise leakage.

For small-diameter applications (pipe sizes from 1/2" to 1 1/2" NB) stainless steel insulation binding wire may be used instead of stainless steel bands and spirally wrapped at 150mm (6 in.) centres. Do not overtighten the wire.

For ease of application, on pipe sizes 1/2" up to 1 1/2" NB, ArmaSound Barrier E of 3 mm and 4 mm thickness can be applied in smaller widths (i.e. between 300 and 500 mm).



All circumferential overlaps on all sizes of vertical pipework (including lower part of large elbows, typically > 457 mm diameter (18 in. NB)) and vessels shall be additionally supported using stainless-steel "S" clips which are secured with stainless-steel bands. Stainless steel bands shall be installed on all barrier layer.

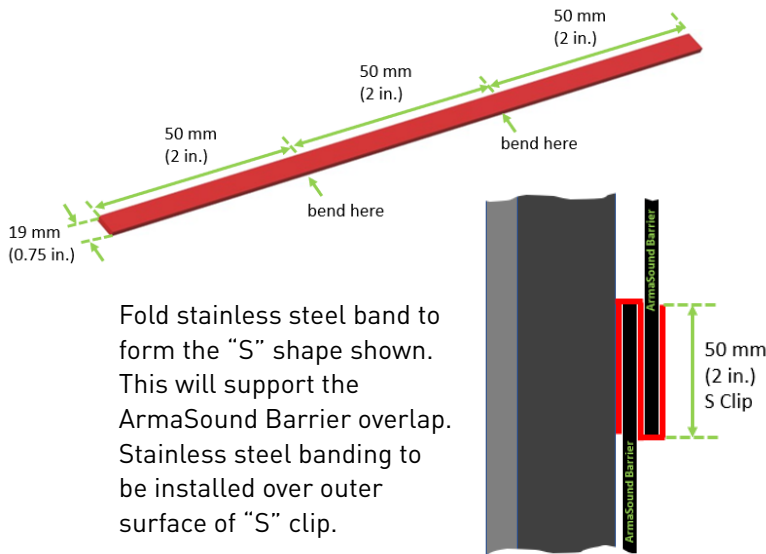


The minimum quantity of “S” clips is indicated in the table below:

Pipe diameter (uninsulated pipe)	Minimum quantity of ‘S’ clips required per fabricated section of material
89 mm – 273 mm (3” - 10” NB)	4
324 – 457 mm (12” - 18” NB)	5
508 – 914 mm (20” - 36” NB)	6
1016 – 1524 mm (40” - 60” NB)	8
>1524 mm (60” NB) & Flat Surface	1 clip every 500 mm (20 in.) & minimum of 2 clips per fabricated ArmaSound Barrier panel section

Note: ‘S’ clips not required on small vertical bend fittings (< 457 mm diameter (18 in. NB)) or on horizontal piping/vessels

“S” clips can be manufactured from waste 150mm (6 in.) lengths of 19mm wide (0.75 in.) x 0.5mm thick stainless-steel bands folded as indicated in the figure below. Note: The “S-clip” is secured in place on the outer surface of the barriers overlap with a stainless steel band and clip.



Insulation Support Rings - Material Slippage Prevention

It is recommended that insulation support rings are used with ArmaSound RD240 and Barrier to help prevent the materials from slippage. The rings shall be sized to support all layers of the thermal and acoustic insulation system. An acoustic insulation collar is required over the support ring to prevent noise leakage via metal-to-metal contact of the mechanical components. The build up of insulation layers shall be the same as the build up of layers on the pipe/vessel with the exception that all insulation parts shall be fully fixed and secured with all over adhesive coverage fixing and stainless bands and clips to prevent slipping and movement of parts.

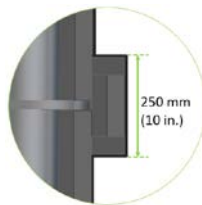


Build up layers of ArmaFlex, ArmaSound RD240 and ArmaSound barrier

Build up layers of ArmaFlex, ArmaSound RD240 over support ring

Complete ArmaSound Barrier layer


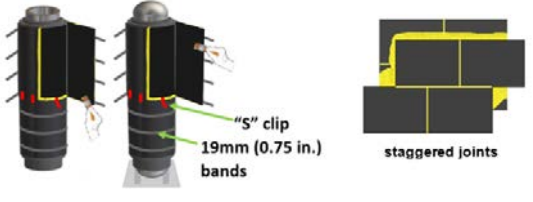

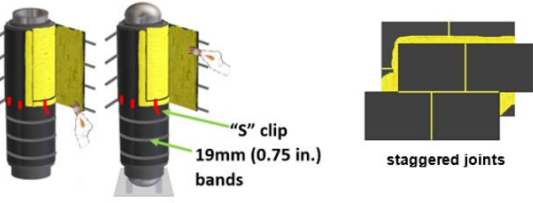
Details of collar of ArmaSound system over support ring. All layers to be constructed the same way as the layers on pipe.



Standard Application Method, ArmaSound Barrier

ALL LAYERS TO BE APPLIED USING SAME METHOD AS FIRST LAYER

Wait between 1 - 12 hours from application of previous layer of ArmaFlex or ArmaSound RD240 before applying layer of ArmaSound RD240 before applying layer of ArmaSound Barrier.

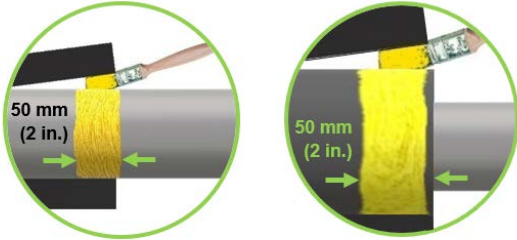
<p>Horizontal Piping, all Ø</p> <ul style="list-style-type: none"> - Adhered overlapped seams/joints - Staggered joints - 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres, including over circumferential ArmaSound Barrier joint overlaps. 	 <p>50 mm (2 in.) adhesive strip</p> <p>staggered joints</p>
<p>Vertical Piping, all Ø</p> <ul style="list-style-type: none"> - Adhered overlapped seams/joints - Staggered joints - S clips to support circumferential joint overlap - 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres, including over circumferential ArmaSound Barrier joint overlaps to secure S clips. 	 <p>"S" clip</p> <p>19mm (0.75 in.) bands</p> <p>staggered joints</p>
<p>Horizontal Vessels/Equipment</p> <ul style="list-style-type: none"> - All-over adhesive covering - Adhered, overlapped seams/joints - Staggered joints - 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres, including over circumferential ArmaSound Barrier joint overlaps. 	 <p>staggered joints</p>
<p>Vertical Vessels/Equipment</p> <ul style="list-style-type: none"> - All-over adhesive covering - Adhered, overlapped seams/joints - Staggered joints - S clips to support circumferential joint overlap - 19 mm (0.75 in.) stainless steel bands spaced at 300mm (12 in.) centres, including over circumferential ArmaSound Barrier joint overlaps to secure S clips. - Insulation support rings are recommended. 	 <p>"S" clip</p> <p>19mm (0.75 in.) bands</p> <p>staggered joints</p>

Horizontal and vertical piping all sizes - all over adhesive coverage fixing may be used optionally for better bondage and CUI mitigation.

Terminations

ARMASOUND RD240

Where the ArmaFlex and ArmaSound insulation terminates at valves, flanges, etc it must be sealed. Insert glue brush to adhere and seal the inner surface to the pipe surface, with a 50 mm (2 in.) strip of ArmaFlex Adhesive (adhesive is applied to both the pipe and ArmaFlex surfaces, unless already fully adhered). Ensure clearance allowed for bolt removal (typically 25mm (1 in.)).



Apply adhesive between pipe and Armaflex to create 50 mm (2 in.) strip

Typical Fabrication of Fittings from ArmaSound Barrier

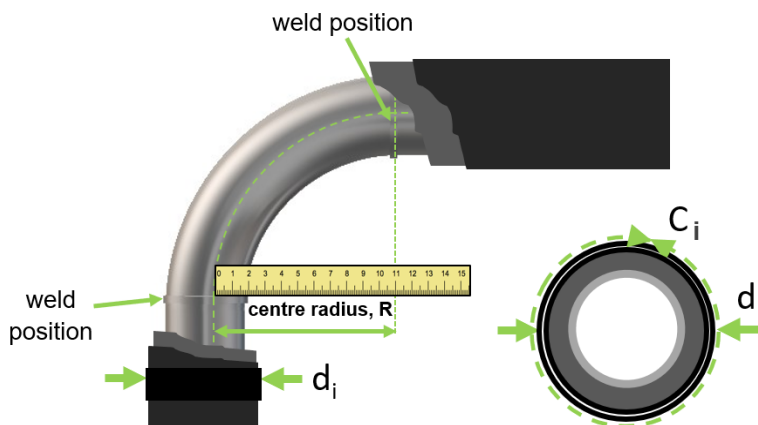
Install fittings to create a water shed. Fabrication of common fittings from ArmaSound Barrier is detailed below. The methods indicated below are one of many ways in which patterns can be fabricated. Other local fabrication methods can be used to produce the appropriate pipe fitting parts.

Fabrication Example

SEGMENTED BEND

A segmented bend/long radius elbow can be manufactured using 3 measurements:

- 1) Elbow centre radius, R , the distance from the centre of the pipe to the weld
- 2) Circumference around outside of insulation, C_i measured by wrapping a strip of Arma-Sound Barrier around the insulated surface
- 3) Insulation outside diameter, d_i measured on the outside of the insulated surface, including the existing barrier and an additional allowance of 2x barrier thickness.

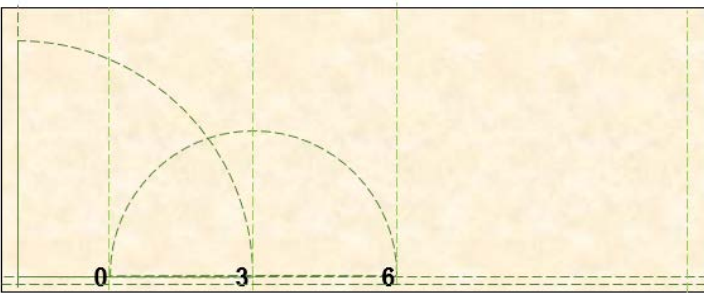
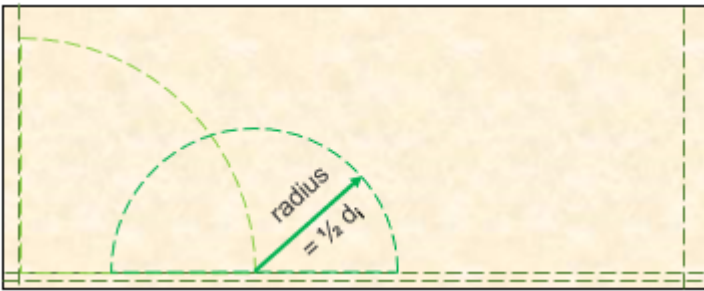


Consult table below to determine quantity of segments for a standard long-radius ($R = 1.5 \varnothing$) elbow. In addition to the segments, 1 starter and 1 finisher piece are required.

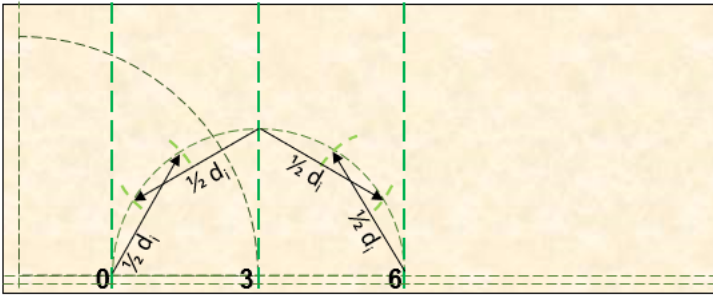
pipe size NB (in.)	pipe OD (mm)	centre radius (mm)	quantity (#) of segments	L1 (mm) = 100(#+1)
0.5	21.3	38		mitre
0.75	26.7	28.5		mitre
1	33.4	38		mitre
1.25	42.2	47.5		mitre
1.5	48.3	57		mitre
2	60.3	76	3	400
2.5	73	95	3	400
3	88.9	114	3	400
3.5	101.6	133	3	400
4	114.3	152	4	500
5	141.3	190	4	500
6	168.3	229	4	500
8	219.1	305	5	600
10	273.1	381	7	800
12	323.9	457	7	800
14	355.6	533	9	1000
16	406.4	610	9	1000
18	457	686	11	1200
20	508	762	11	1200
22	558.8	838.2	11	1200
24	610	914	13	1400
26	660.4	990.6	13	1400
28	711.2	1066.8	13	1400
30	762	1143	13	1400
32	812.8	1219.2	13	1400
34	863.6	1295.4	15	1600
36	914	1372	15	1600
38	965.2	1447.8	15	1600
40	1016	1524	15	1600
42	1066.8	1600.2	15	1600
44	1117.6	1676.4	17	1800
46	1168.4	1752.6	17	1800
48	1219.2	1828.8	17	1800
50	1270	1905	19	2000
52	1320.8	1981.2	19	2000
54	1371.6	2057.4	19	2000
56	1422.4	2133.6	21	2200
58	1473.2	2209.8	21	2200
60	1524	2286	21	2200
62	1574.8	2362.2	21	2200
64	1625.6	2438.4	23	2400
66	1676.4	2514.6	23	2400
68	1727.2	2590.8	23	2400
70	1778	2667	23	2400
72	1828.8	2743.2	23	2400

If required, increase quantity of segments for greater insulation thicknesses.

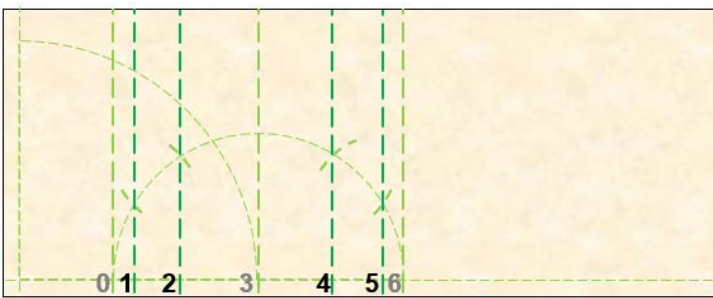
$L_1 = (1 + \text{quantity of segments}) \times 100\text{mm (4in.)}$



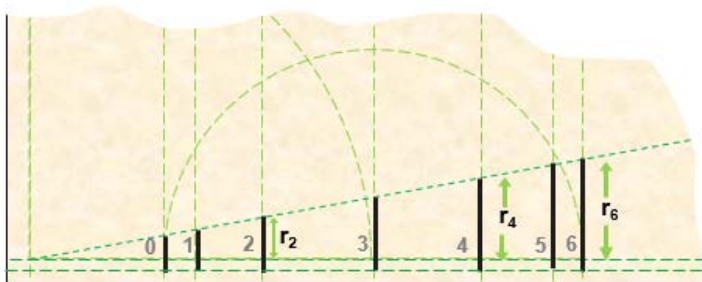
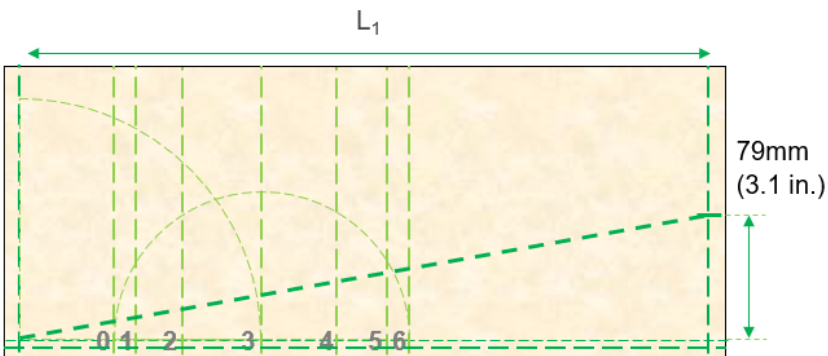
Draw 3 vertical lines from the intersections of the curves with the base line. Label the lines 0, 3, 6



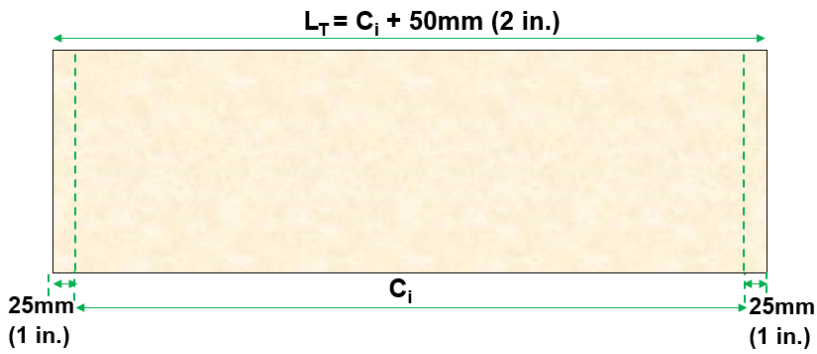
Draw 4 arcs of radius = $\frac{1}{2} d_i$ from the intersections of the vertical lines with the second curve, to intersect the second curve



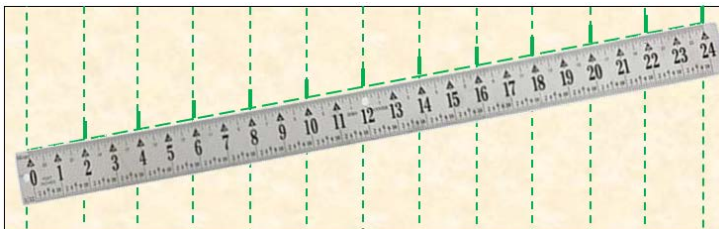
Draw 4 more vertical lines through the intersections of the arcs with the second curve. Label these vertical lines 1, 2, 4, 5.



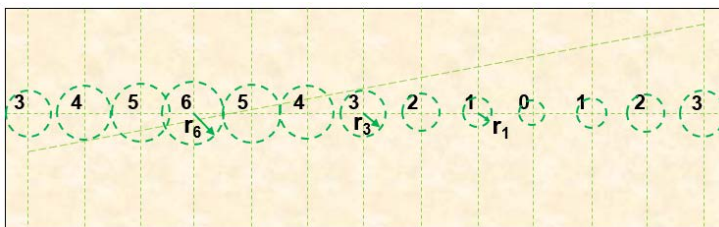
Draw 3 vertical lines from the intersections of the curves with the base line. Label the lines 0, 3, 6



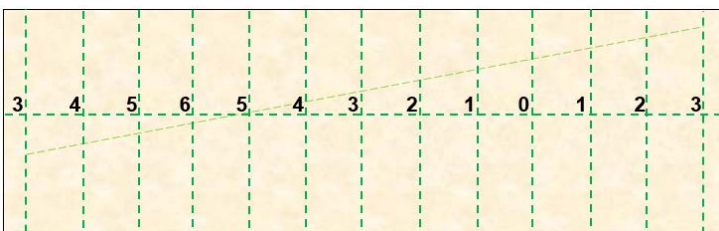
Use a new template and mark out the length L_T to equal the circumference $C_i + 50\text{mm (2 in.)}$. Mark a vertical line 25mm (1 in.) in from each side



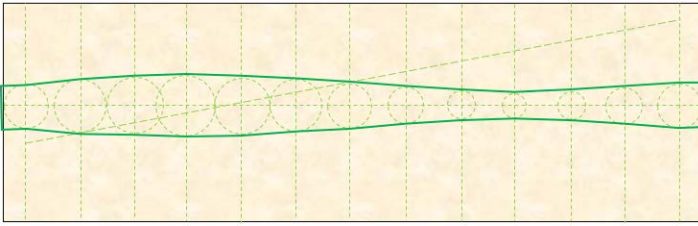
Draw a diagonal line of any length divisible by 12 and mark the line into 12 parts. Larger elbows may require division into 14 parts. Use these marks to draw vertical lines. This is a simple technique which makes dividing the template into equal parts much easier.



Draw circles using the lengths r_0 to r_6 from the previous template as the radii of circles. Centre the circles on the intersections of the horizontal line with the numbered vertical lines



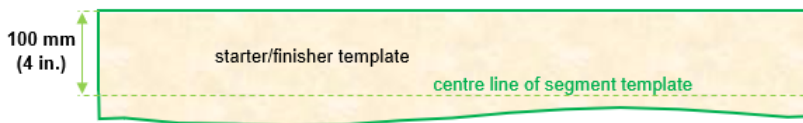
Draw a horizontal line in the centre and number the intersections as shown



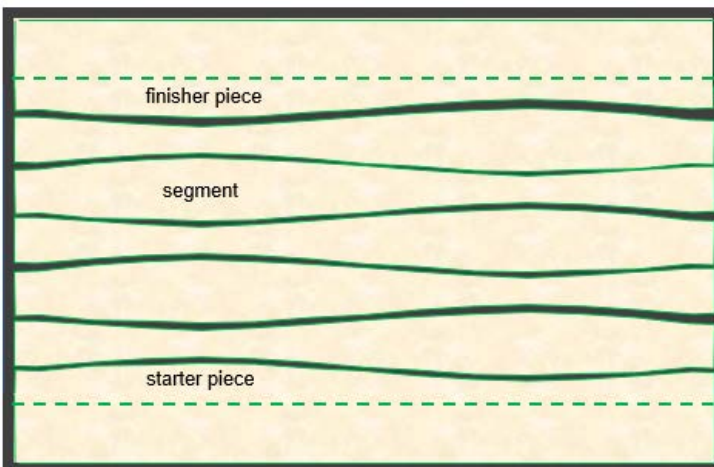
Draw smooth lines to join the circles.



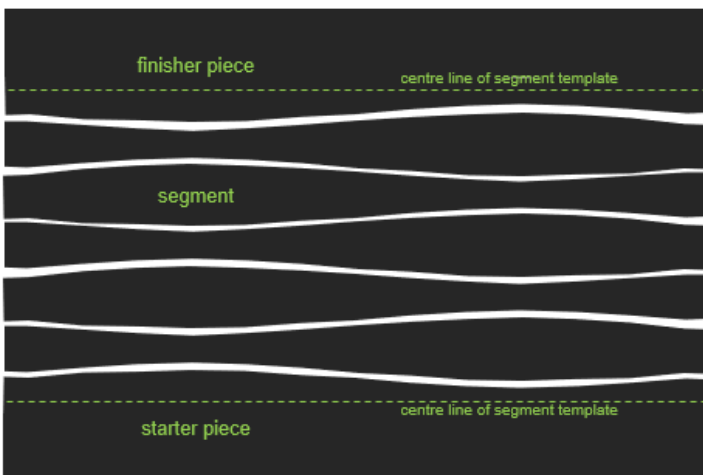
Cut out the segment template



Create starter/finisher template by adding 100mm (4 in.) to half of a segment piece



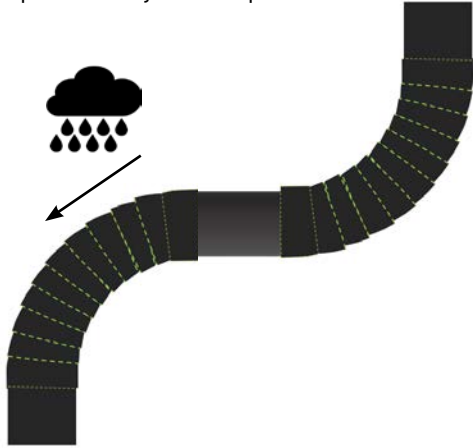
Use the template to mark out the ArmaSound Barrier with a starter piece, appropriate quantity of segments and a finisher piece.



Cut out the pieces of ArmaSound Barrier

Installation - (Overlaps)

When applying ArmaSound Barrier always ensure that the overlaps are positioned to shed water (roof tile effect) so that an upper piece always overlaps/fits over a lower piece.



Apply starter piece of ArmaSound Barrier, overlapping existing straight section by 10mm and adhering overlaps. Ensure smallest dimension is on inside of bend and largest dimension on outside of bend if the overlap is positioned along the center radius.



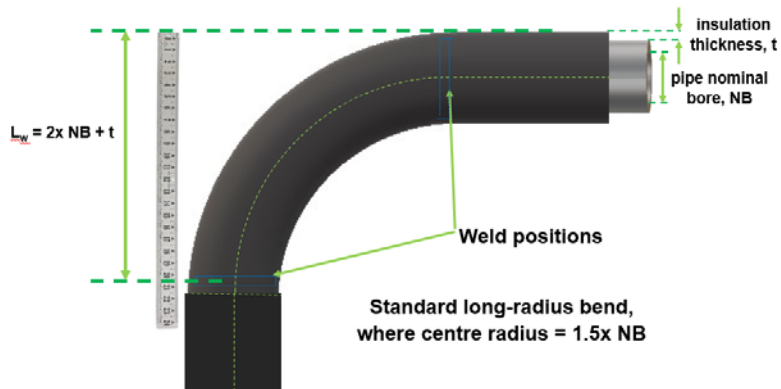
Adhere overlap



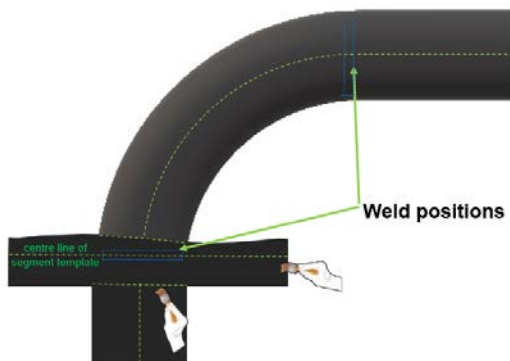
Apply next piece, overlapping and adhering to previous piece by 10mm and ensure that joint will shed water

Installation Method

Locate the weld positions. These are impossible to see when the pipe is insulated but can be determined by measuring from the outside of the insulation, a distance LW (= the total installed insulation thickness t + $2x$ the nominal bore) along the other part of the elbow. This method applies for a standard long radius elbow only, and would need adapting for other elbow types.

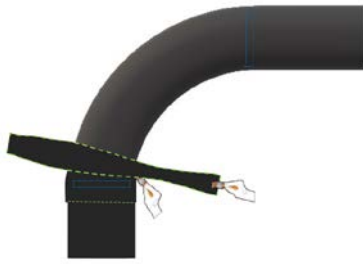


Ensure that orientation will create water shed. Position the starter piece by aligning the centre line of the segment part with the weld line. Adhere the circumferential and end overlaps in place and wet seal overlaps.

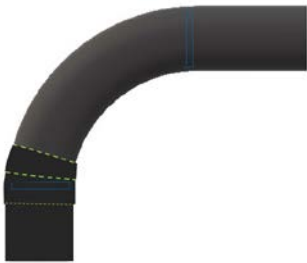




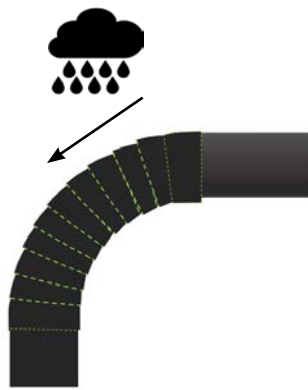
Complete starter piece



Apply next segment



Adhere segment



Continue to apply remaining pieces,
and apply/adhere finisher piece

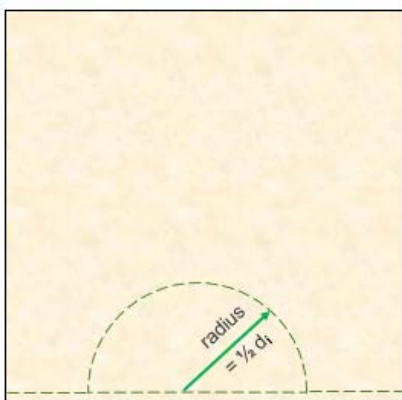
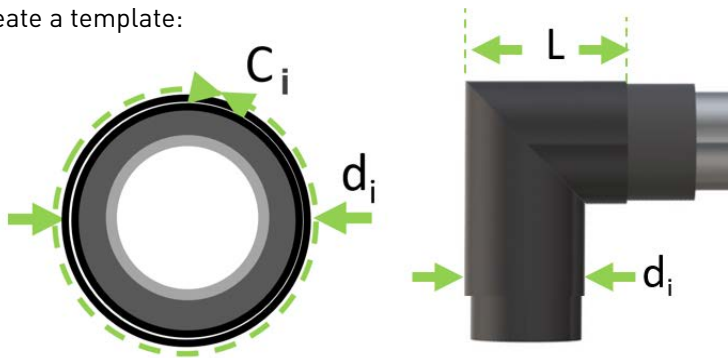
Fabrication & Installation Example - (Elbow)

MITRED ELBOW

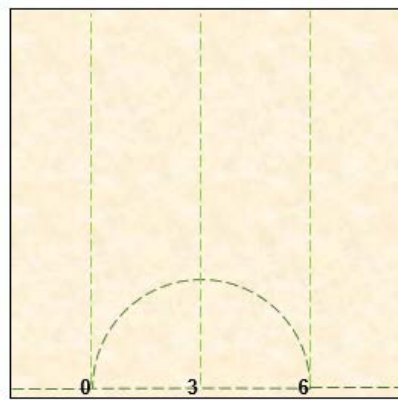
A mitred elbow can be manufactured using 3 measurements:

- 1) Circumference around outside of insulation, C_i measured by wrapping a strip of Arma-Sound Barrier around the insulated surface
- 2) Insulation outside diameter, d_i measured on the outside of the insulated pipe surface, including the existing barrier and an additional allowance of 2x barrier thickness.
- 3) Leg length, L

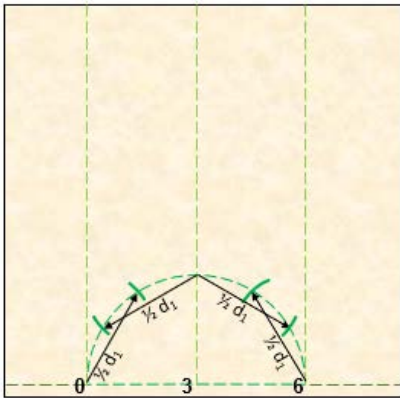
Create a template:



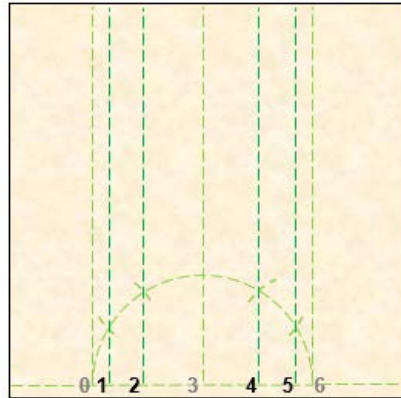
Draw a horizontal line and a semi-circular arc of radius = $\frac{1}{2}$



Draw 3 vertical lines from the intersections of the curves with the base line.
Label the lines 0, 3, 6



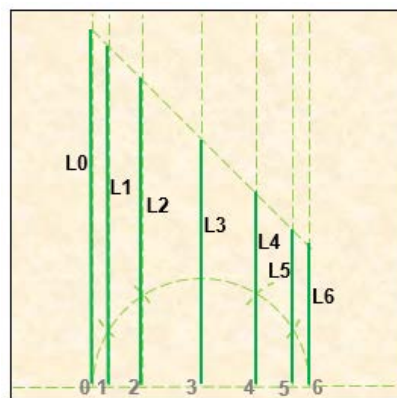
Draw 4 arcs of radius = $\frac{1}{2} d_1$ from the intersections of the vertical lines with the second curve, to intersect the second curve horizontal line and a semi-circular arc of radius = $\frac{1}{2}$



Draw 4 more vertical lines through the intersections of the arcs with the second curve. Label these vertical lines 1, 2, 4, 5.

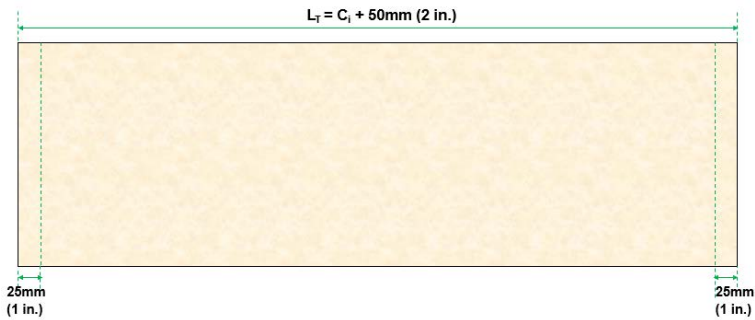


Draw a line at 45° from the horizontal for a 90° degree elbow (or 22.5° from the horizontal for a 45° elbow). The height of the diagonal above the base determines the elbow length, L

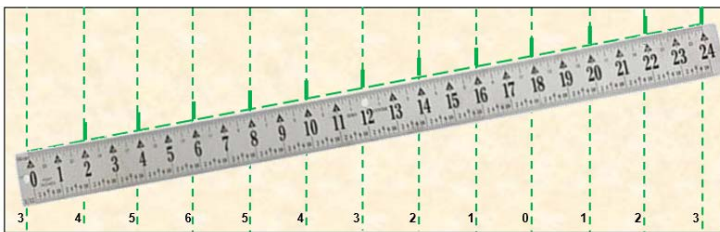


Mark and measure the length of vertical lines between the diagonal line and the horizontal base line. Label these vertical lines L0, L1, L2, L3, L4, L5, L6

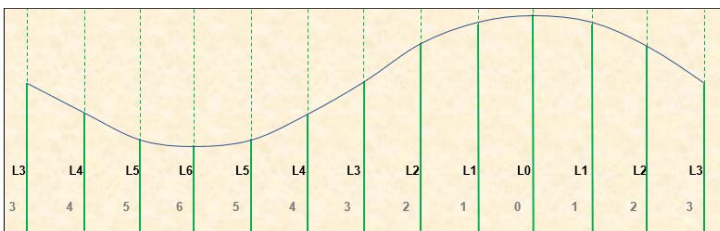
Create a template:



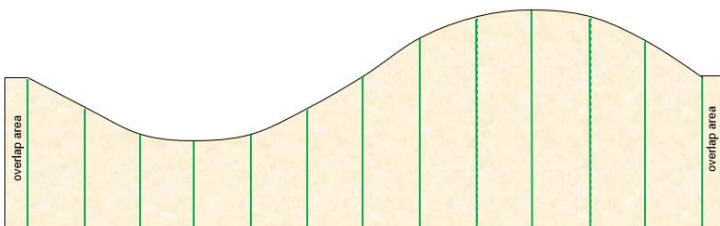
Use a new template of length L_T to equal the circumference $C_i + 50\text{mm}$ (2 in.). Mark a vertical line 25mm (1 in.) in from each side.



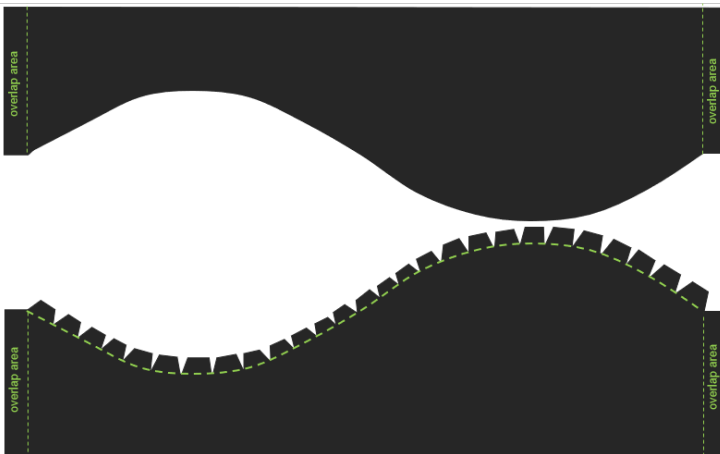
Draw a diagonal line of any length divisible by 12 and mark the line into 12 parts. Larger elbows may require division into more parts. Use these marks to draw vertical lines and label with numbers as shown.



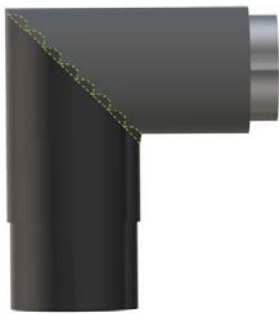
Mark the lengths L_0 to L_6 as previously measured, with L_0 at position 0, L_1 at position 1, etc. Join the tops of the lines with a smooth curve.



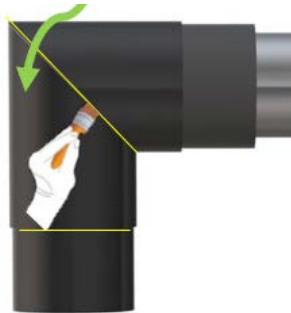
Cut along the curve and extend horizontal cuts into the overlap areas.



Use template to cut out two pieces, ensuring that minimum 10mm (0.4 in.) feathered overlaps are added to one edge.



Apply the first, lower, piece with feathered overlaps positioned to be under second piece

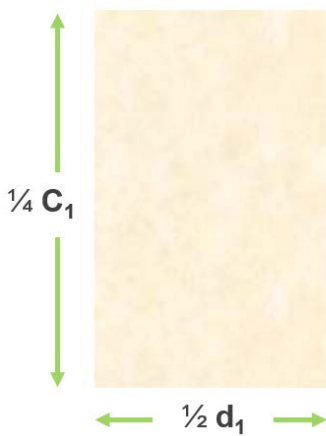
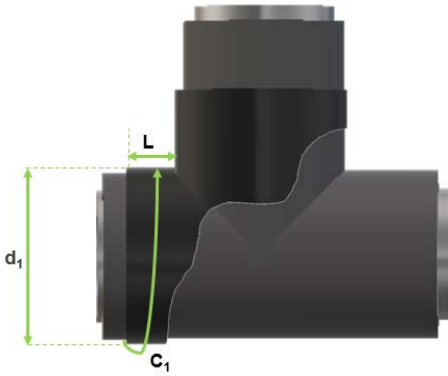


Ensure that second piece will overlap the feathered overlaps of the first so that it will shed water. Wet seal seam with adhesive

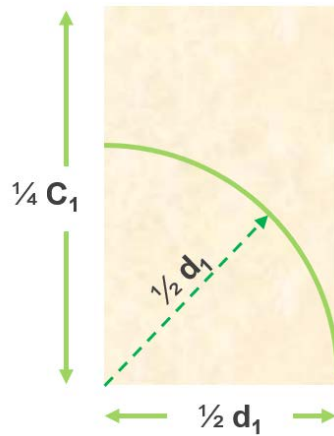
Example Fabrication & Installation (T - Piece)

EQUAL T PIECE

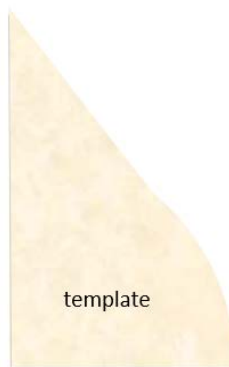
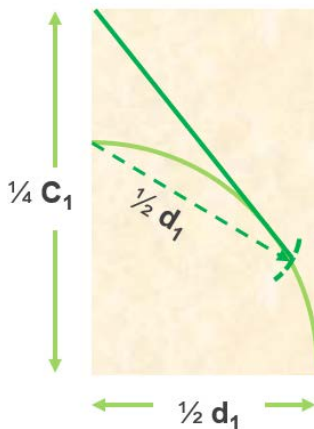
Measure the external circumference, C_1 and diameter, d_1 over the insulation. Use these measurements to create a template for marking out how to cut the ArmaSound Barrier.



Cut a rectangular template, length = $\frac{1}{4} c$, height = $\frac{1}{2} d_1$

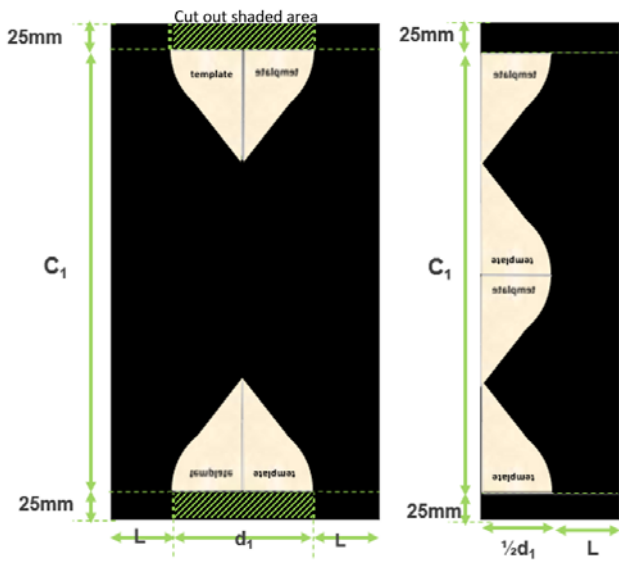


Draw an arc, radius = $\frac{1}{2} d_1$



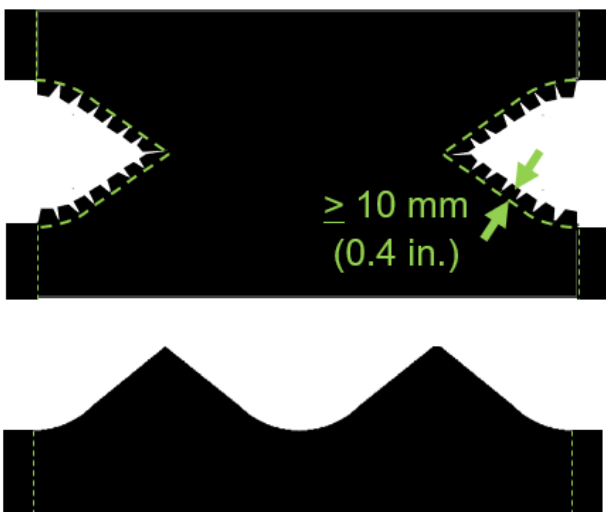
Using the left side of the original arc as the origin, mark a distance $\frac{1}{2} d_1$ along the original arc. Draw a line from the intersection to the top corner and cut the template as shown.

Use template to mark out two sheets of ArmaSound Barrier, as shown below, marking 2 lines 25mm from each end.



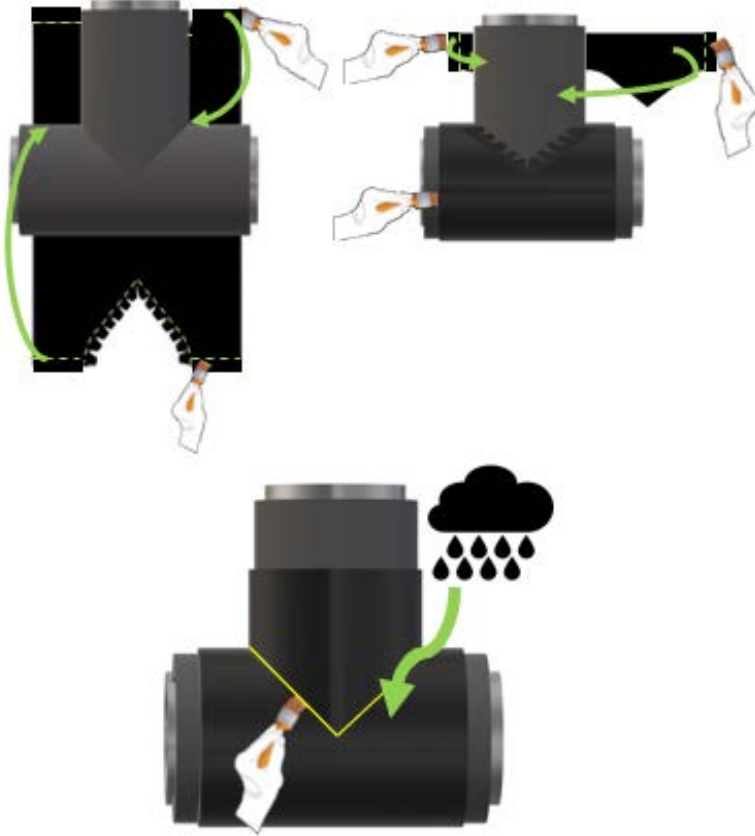
L = desired leg lengths of T piece (typically > 50mm (2 in.)).

The ArmaSound Barrier overlaps must be positioned to shed water. In the example shown, the vertical branch must fit over the horizontal branch to shed water, so minimum 10mm feathered overlaps must be added to the markout for the horizontal piece so that when cut out it will look as shown below:



ArmaSound Barrier pieces with feathered overlaps, > 10 mm (0.4 in) long

Cut out ArmaSound Barrier pieces and wrap around T piece, applying adhesive to secure joints, and 50 mm (2 in.) strips of adhesive between underlying insulation and ArmaSound Barrier to seal.

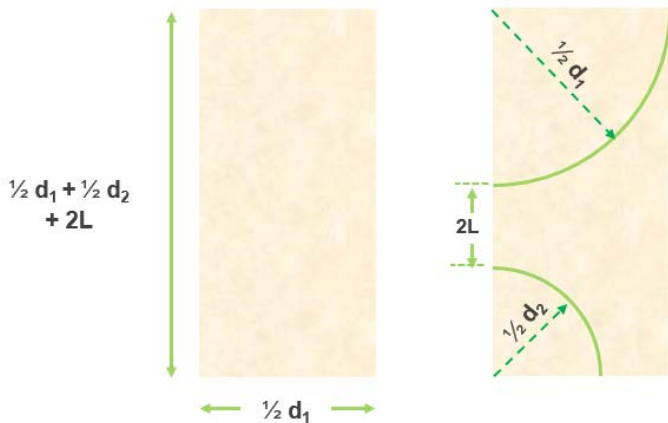
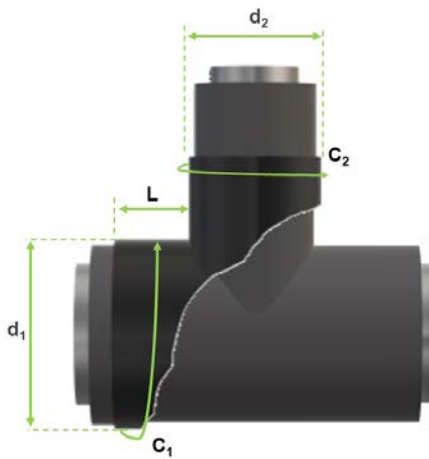


Fabrication & Installation Example (T - Piece)

UNEQUAL T PIECE

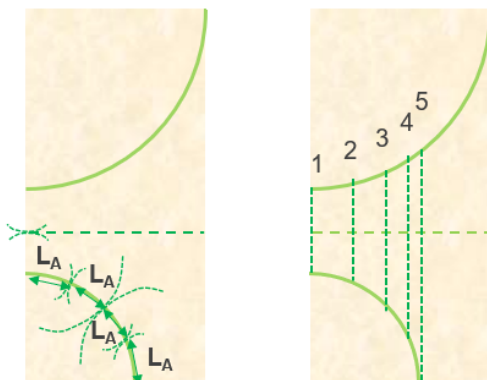
Measure the external circumferences, C_1 and C_2 , and diameters d_1 and d_2 , over the ArmaFlex insulation. Use these measurements to create a template for marking out how to cut the ArmaSound Barrier. Leg length $L = 50\text{mm}$ (2 in.) or longer.

Start by preparing a piece of ArmaSound Barrier to wrap around the smaller branch.



Use a rectangular template, height = $(\frac{1}{2} d_1 + \frac{1}{2} d_2 + 2L)$, width = $\frac{1}{2} d_1$

Draw two arcs from the corners, radius = $\frac{1}{2} d_1$ and $\frac{1}{2} d_2$

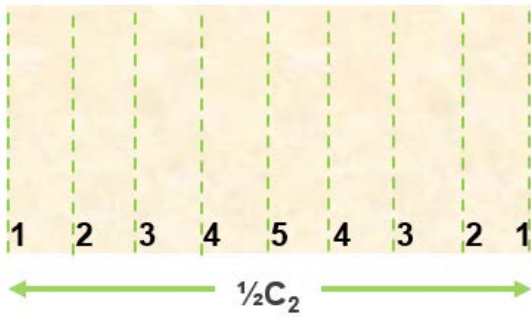


Divide the gap between the arcs into 2 equal parts, length = $\frac{1}{2} L$ and draw a horizontal line. Divide the smaller arc into 4 parts of equal arc length, L_A

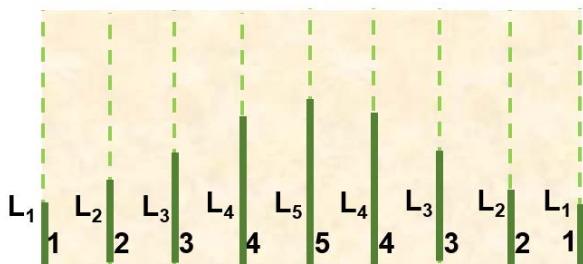
Starting from the divisions and ends of the smaller arc, draw horizontal lines to join the larger and smaller arcs. Label 1 to 5



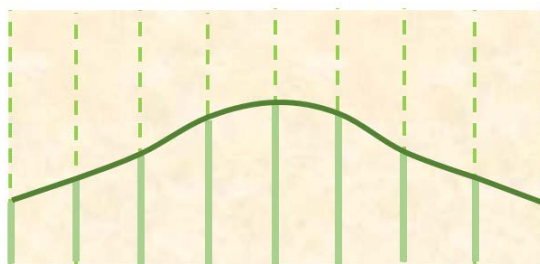
Measure the distances between the larger arc and the horizontal dividing line and label L₁ to L₅



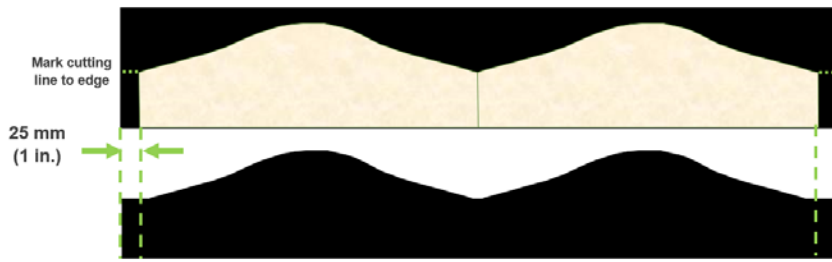
Cut a new template, length = $\frac{1}{2}C_2$ and divide into 8 parts. Label as shown



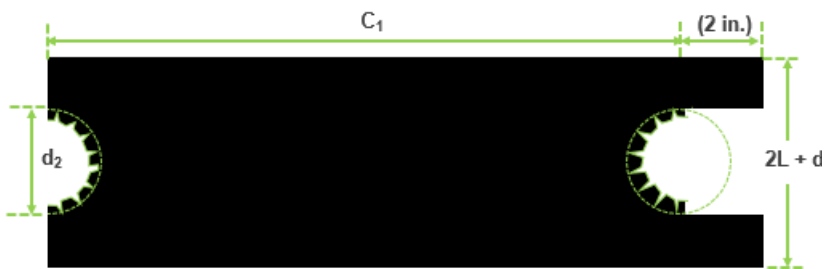
Transfer the measurements L1 to L5 onto the template at the positions 1 to 5



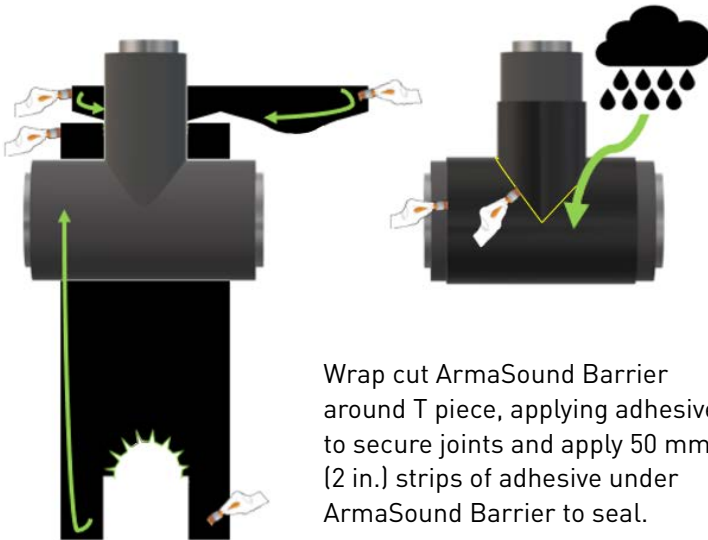
Join the tops of the lines together to form a curve. Cut out bottom part of template.



Use template to mark out and cut out the ArmaSound Barrier for the small branch of the T piece, making sure to add 25mm (1 in.) overlap at either end.



Cut a sheet of ArmaSound Barrier for the body, length $C_1 + 50$ mm (2 in.) and width $(2L + d_1)$. Cut out a semi-circular disc of diameter d_2 , at one end. Cut out another disc of diameter d_2 , at distance of centres C_1 from the first disc but add 10 mm feathered overlaps to create an overlap.



Wrap cut ArmaSound Barrier around T piece, applying adhesive to secure joints and apply 50 mm (2 in.) strips of adhesive under ArmaSound Barrier to seal.

Fabrication & Installation Example (Reducer)

REDUCTION IN PIPE DIAMETER

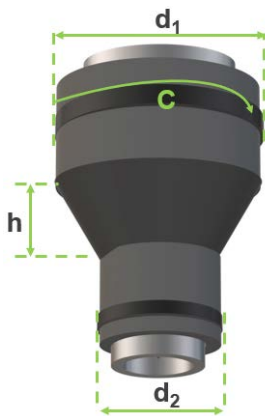
Measure the height, h , of the reducer.

Wrap ArmaSound Barrier around the larger pipe and measure the diameter, d_1 .

Wrap ArmaSound Barrier around the smaller pipe and measure the diameter, d_2 .

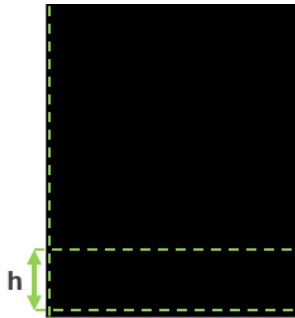
Cut a strip of ArmaSound Barrier which fits around the larger pipe easily. Mark it as C.

Start by preparing a piece of ArmaSound Barrier to wrap around the smaller branch.

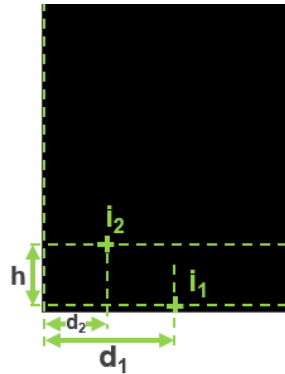


Fix and adhere first (lowest) piece of ArmaSound barrier, cutting minimum 10mm feathered overlaps for the overlap so that the next layer will shed water.

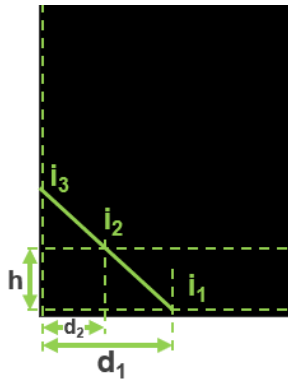
Create tapered reducer piece from ArmaSound barrier.



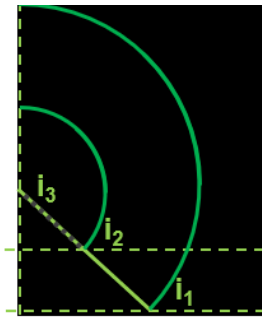
Draw a vertical edge line and two perpendicular horizontal lines separated by the cone height, h



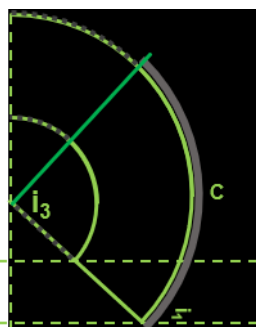
Mark two vertical lines at distances d_1 and d_2 from the vertical edge line. Mark intersections i_1 and i_2



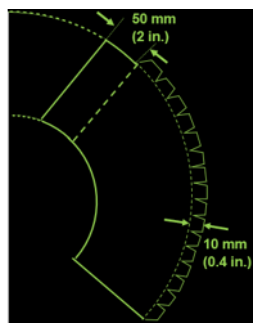
Draw a sloping line joining intersections i_1 and i_2 to the vertical edge line, mark intersection i_3



Draw two arcs, centred at i_3 at radius i_1 and i_2



Lay the strip, **C**, along the largest arc, starting at i_1 and draw a line from where it ends to i_3



Add overlap flaps $\geq 10\text{mm}$ (0.4 in.) long and add 50mm (2 in.) flap to one end of arc.

Apply ArmaSound Barrier above the reducer piece, applying adhesive to secure and seal the overlap using the wet-seal method. Ensure that overlaps are positioned to shed water.

Arma-Chek Mastic may be used to help ensure an acoustic seal.



Flexible Outer Jacketing

Application of Arma-Chek flexible, non-metallic jacketing is described in Arma-Chek R Industrial Application Guide.

Arma-Chek R shall only be installed as a 2 mm thick layer for acoustic applications.

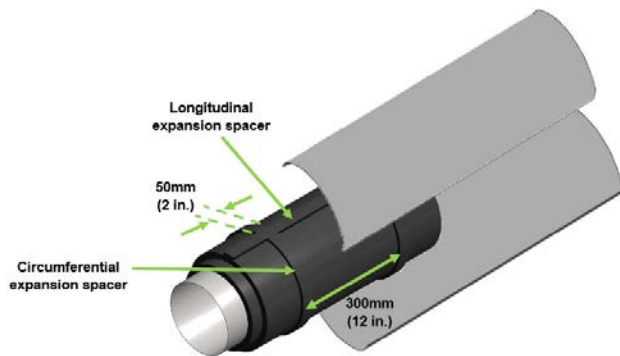
Allow at least 3 - 24 hours adhesive curing time (depending on adhesive fixing method of the Arma-Chek R) before applying any sealed jacket over ArmaFlex, ArmaSound RD240, or ArmaSound Barrier. It is recommended that the Arma-Chek R is applied within 5 days of completion of application of the previous layers of insulation.



3 - 24 hours ≤  ≤ 120 hours (5 days)

Rigid Outer Cladding / Jacketing

Application of rigid outer cladding/jacketing will require the use of spacers to provide an acoustic function, or when the process operating temperature (or interface temperature between ArmaFlex and other insulation materials) is $> 40^{\circ}\text{C}$ (104°F).



When ArmaSound acoustic systems incorporate spacers, additional thermal expansion spacers are not usually required; please consult Armacell Energy for guidance.

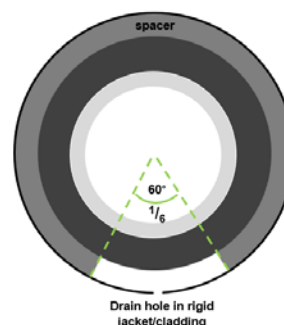
Spacers shall be fabricated from various thicknesses of Armaflex Industrial (FEF) sheet and / or Armaflex self-adhesive insulation tape of 3 mm thickness ($1/8$ in.). The width of the spacers shall be 50 mm and the spacers shall be applied at 300 mm centres throughout the entire length of the insulated piping system, including all attached piping fittings.

Spacers shall be fixed and secured with Armaflex Adhesive HT625 directly around the circumference of the outer surface of the underlying insulation layer. In addition, for horizontal pipes, a 50 mm wide longitudinal expansion spacer strip shall also be applied at the twelve o'clock position, in between the circumferential expansion spacers.

Preformed UV-cured GRP (glass-reinforced plastic) or metal cladding may be used. In all cases the thickness and mass of the rigid cladding shall be in accordance with the specified acoustic insulation system.

PRECAUTIONS WHEN USING METAL BANDING: If metal banding is applied, locate directly over the ArmaFlex spacers and not over the void area.

PRECAUTIONS WHEN USING DRAIN HOLES: If drain holes are specified by the engineering consultant, locate the ArmaFlex spacers around the upper $5/6$ of the circumference to allow for drainage. Removable plugs may be required to prevent water/water vapour ingress or acoustic leakage.



Expansion Spaces Thickness

Use Arma Flex strips to achieve the required thickness.

Pipe Size NB [Inch]	Pipe OD [mm]	Operating Temperature				
		Expansion spacer thickness [mm]				
		40 to 60°C	61 to 80°C	81 to 100°C	101 to 120°C	>120°C
0.5	21.3	3	3	3	6	6
0.75	26.7	3	3	3	6	6
1	33.4	3	3	3	6	6
1.5	48.3	3	3	6	6	6
2	60.3	3	3	6	6	6
3	88.9	3	3	6	6	6
4	114.3	3	3	6	6	6
6	168.3	3	6	6	6	6
8	219.1	3	6	6	6	6
10	273.1	3	6	6	6	6
12	323.9	3	6	6	6	6
14	355.6	3	6	6	6	6
16	406.4	3	6	6	6	6
18	457	3	6	6	6	10
20	508	3	6	6	6	10
24	610	3	6	6	6	10
> 24" or Flat Surface	> 610 or Flat Surface	3	6	6	6	10

Note: Expansion spacer material – Armaflex Industrial (FEF)

Note: System A spacer thickness shall be as specified in ArmaFlex Application Guide

Expansion Spaces Thickness

Use Arma Flex strips to achieve the required thickness.

Pipe Size NB [Inch]	Pipe OD [mm]	Operating Temperature				
		Expansion spacer thickness [in.]				
		40 to 60°C	61 to 80°C	81 to 100°C	101 to 120°C	>120°C
0.5	21.3	1/8	1/8	1/8	1/4	1/4
0.75	26.7	1/8	1/8	1/8	1/4	1/4
1	33.4	1/8	1/8	1/8	1/4	1/4
1.5	48.3	1/8	1/8	1/4	1/4	1/4
2	60.3	1/8	1/8	1/4	1/4	1/4
3	88.9	1/8	1/8	1/4	1/4	1/4
4	114.3	1/8	1/8	1/4	1/4	1/4
6	168.3	1/8	1/4	1/4	1/4	1/4
8	219.1	1/8	1/4	1/4	1/4	1/4
10	273.1	1/8	1/4	1/4	1/4	1/4
12	323.9	1/8	1/4	1/4	1/4	1/4
14	355.6	1/8	1/4	1/4	1/4	1/4
16	406.4	1/8	1/4	1/4	1/4	1/4
18	457	1/8	1/4	1/4	1/4	4/10
20	508	1/8	1/4	1/4	1/4	4/10
24	610	1/8	1/4	1/4	1/4	4/10
> 24" or Flat Surface	> 610 or Flat Surface	1/8	1/4	1/4	1/4	4/10

Note: Expansion spacer material – Armaflex Industrial (FEF)

Note: System A spacer thickness shall be as specified in ArmaFlex Application Guide

Pipe Supports

Metal-clamp and shoe pipe supports may be insulated as described below. Guidance for cryogenic HDPU insulated supports is available from Energy Technical Services. Wherever a steel structure is used to support a pipe requiring acoustic insulation, it is standard practice to apply vibration isolation between the support and pipe in order to reduce the transfer of structure-borne noise. Details relating to the design and specification of vibration isolation devices are not part of Armacell's scope.

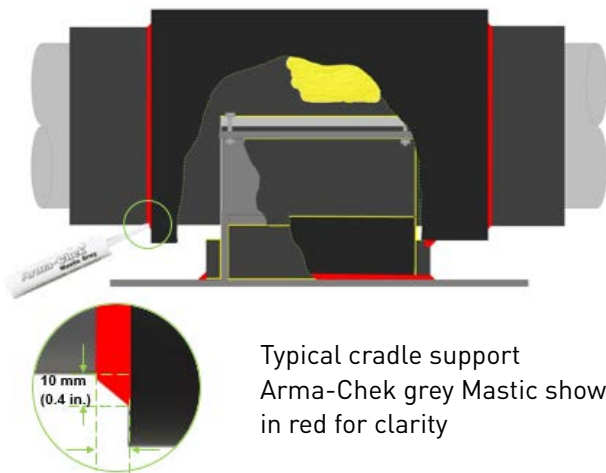
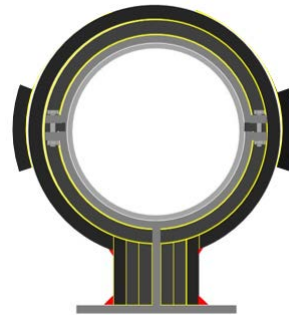
Armacell recommend that the chosen ArmaSound Industrial System is extended down the support to the vibration isolator. If vibration isolation is not provided, the ArmaSound Industrial System should be extended down the full length of the support to the base plate or foundation.

In all cases the first layer of ArmaFlex on the pipe shall be tight butted up to the support and secured and sealed by at least a 50mm (2 in.) strip of adhesive and Arma-Chek Mastic. Voids in supports shall be filled with ArmaFlex to provide a continuous surface over which to apply the full specified thickness of ArmaFlex and ArmaSound.

Any clamps or bolts may be insulated with the full specified thickness of ArmaFlex using additional layers of ArmaFlex to build up a continuous surface. The insulation may alternatively be thinner over the clamp bolts.

The ArmaSound RD240 and/or Barrier components shall be continuous over the support and pipework without gaps. Apply insulation extensions to support legs to reduce heat transfer and noise leakage in accordance with the engineering specification. This insulation shall be the same thickness and type as specified for the piping.

Arma-Chek Mastic shall be used to seal terminations.



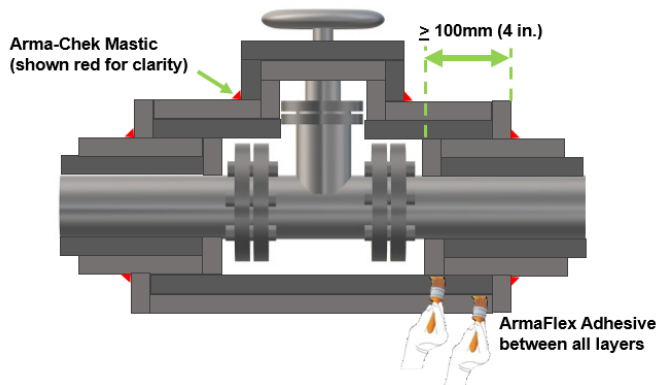
Typical cradle support
Arma-Chek grey Mastic shown
in red for clarity

Valve / Flange Insulation

Valve/flanges may be constructed from layers of ArmaFlex/ArmaSound insulation and may be covered with Arma-Chek R x 2mm thick outer jacketing. Alternatively, metal boxes may be used and lined with ArmaFlex/ArmaSound for ease of removal for maintenance purposes.

NON-REMOVABLE INSULATION METHOD: Apply ArmaFlex Industrial, ArmaSound RD240 and ArmaSound Barrier E layers as required by the project specification directly around the body & stem of the valve or flange. The total insulation thickness and build-up of materials shall be the same as for the pipe insulation.

The insulation layering shall follow the contours of the valve/flange and all joints be staggered and adhered with ArmaFlex Adhesive and where applicable stainless steel bands.

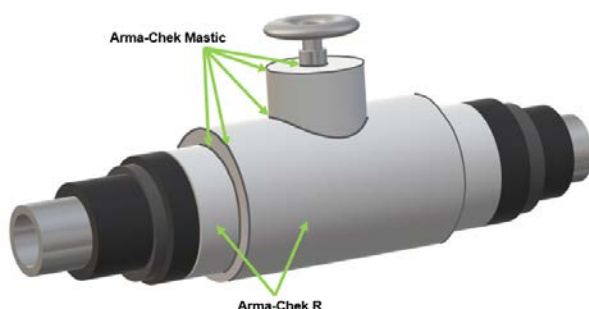


For cold applications the void shall be filled with a loose fill of ArmaFlex or glass wool.

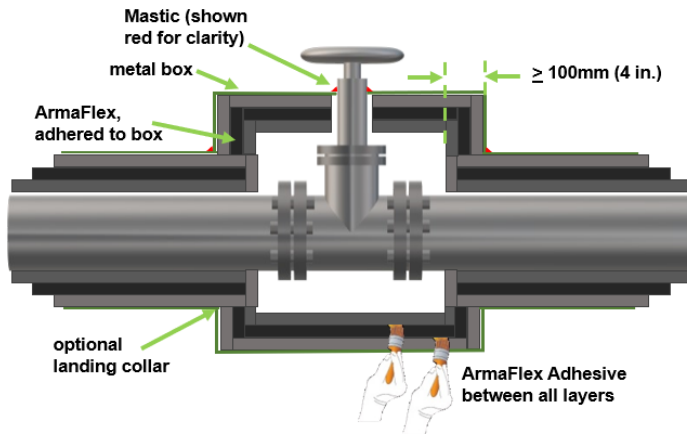
The insulation should extend over the adjacent insulated piping terminations by a minimum of 100 mm either side of the insulation terminations, and shall be fully fixed with Armaflex Adhesive and sealed with Arma-Chek Mastic. Allowance shall be made for flange bolt removal, if required. The insulation shall be fully covered with Arma-Chek R outer covering.

The construction of valve/flange covers shall follow the general guidance given in the ArmaFlex, ArmaSound and Arma-Chek R Application Guidelines.

Valve stems shall be weather sealed with Arma-Chek Mastic and each time the valve is operated.



REMOVABLE METAL BOXES: Alternatively, metal boxes may be used and lined with ArmaFlex/ArmaSound RD 240 / ArmaSound Acoustic Barrier as shown below.

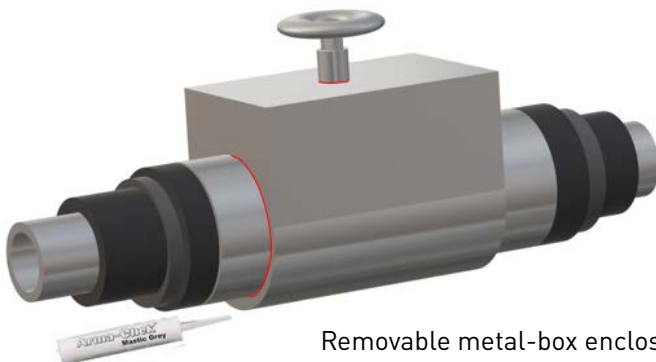


For installation, cut outs will be required over the existing pipe insulation, extending at least 100mm (4 in.) past the pipe insulation terminations. These and other cut outs/penetrations shall be fully sealed with appropriate mastic sealant. Allowance shall be made for flange bolt removal, if required.

The use of metal landing collars or metal sleeves shall be considered to prevent the box cutting into the pipe covering/outer Arma-Chek R outer jacket where used. Sleeves shall be secured with metal bands and vapour sealed with an appropriate extruded sealant.

The application of ArmaFlex shall follow the general guidance given in the Application Guidelines.

If a valve stem penetrates the box, it shall be resealed with appropriate mastic each time the valve is operated



Removable metal-box enclosure, lined with ArmaFlex/ArmaSound

Inspection Checklist

Continuous or frequent supervision of all application activities is recommended and as a minimum the following inspections shall be carried during every working period.

Inspection Activity – ArmaSound Barrier	Completed ✓
Temperature and relative humidity monitored and recorded during installation. Precautions taken if weather conditions unsuitable for application	
All insulation layers to be clean, dry, fit for purpose and of the specified thickness. All pipes/surfaces to be insulated clean, dry and inspected/released for insulation application and have been stored in the correct conditions before use.	
All circumferential and longitudinal piping/vessel overlaps (of minimum 50 mm) staggered, fixed down with ArmaFlex Adhesive	
All circumferential overlaps on bend fabrication segments / gores be a minimum of 10 mm staggered, fixed down with ArmaFlex Adhesive	
All longitudinal seam joints 'staggered' and positioned to shed water -Insulation fixed and secured to underlying pipe / vessel / insulation surface as per the appropriate Application Manual	
All underlying insulation is covered over with ArmaSound Barrier as per Application Guide	
Barrier not directly touching metal pipe/vessel/fittings surfaces	
Insulation support rings/supports are fitted on all vertical piping to prevent material slipping	
Stainless steel bands of correct thickness/width fitted at 300 mm centres	
Stainless steel S clips installed on all vertical piping/vessels/equipment	
Barrier layers observed to be damage free	
Barrier layers observed to be damage free: if damaged repair or replace	
Subsequent layers applied using same application method as first layer and with staggered joints/seams	

Inspection Checklist

Continuous or frequent supervision of all application activities is recommended and as a minimum the following inspections shall be carried during every working period.

Inspection Activity – ArmaSound RD240	Completed ✓
Temperature and relative humidity monitored and recorded during installation. Precautions taken if weather conditions unsuitable for application and have been stored in the correct conditions before use.	
All insulation layers to be clean, dry, fit for purpose and of the specified thickness. All pipes/surfaces to be insulated clean, dry and inspected/released for insulation application.	
All circumferential butt joints tightly fitted and secured with no gaps. Adhered/vapour sealed with applicable ArmaFlex Adhesive.	
All circumferential butt joints installed under compression	
All longitudinal seam joints tightly fitted and secured with no gaps. Adhered/vapour sealed with applicable ArmaFlex Adhesive..	
All longitudinal seam joints 'staggered' and positioned to shed water.	
If all-over adhesive coverage fixing used, all longitudinal seam joints to be installed under compression. -ArmaSound RD 240 is fixed to the underlying insulation surface as per Application Manual.	
Vapour sealing of all seams and joints on all layers using ArmaFlex adhesive.	
Insulation layers tight-butted to pipe supports and vapour sealed with ArmaFlex adhesive. Thickness and type of insulation identical to connecting pipe. All connecting metal parts fully insulated and fully weather sealed against water ingress with Arma-Chek Mastic.	
ArmaSound RD 240 has not been installed directly to the pipe / vessel surface/s.	
Insulation support rings/supports are fitted on all vertical piping to prevent material from slippage.	
Stainless steel bands of correct thickness/width fitted at 300 mm centres on insulation layer i.e.: -Horizontal Piping – ArmaSound Industrial System (EL) B only. -Vertical Piping – ArmaSound Industrial System (EL) B, C & D only	
Insulation layers observed to be damage free: if damaged repair or replace	
Subsequent layers applied using same application method as first layer	

Appendix A - Acoustic System Descriptions

ArmaSound Industrial Systems are constructed from multiple layers and various thicknesses of different materials, combined to achieve the required acoustic performance specified for Systems A to D.

The numbers in the table below represent the relative positions of the component layers, starting from the pipe/vessel. Further details are included in the ArmaSound Industrial Systems brochure.

	Initial layer(s)		Other components					Jacket/cladding		
	ArmaFlex Industrial LT or HT	ArmaGel	ArmaSound RD240	Barrier E	Bituminised barrier	ArmaFlex spacers	Arma-Chek R	GRP	Aluminium	Steel
ArmaSound System AF (EL): ArmaFlex with Arma-Chek R jacket, layer build up										
System A	1						2			
System B	1		2				3			
System C	1		2	3, 4			5			
System D	1, 5		2, 3	4			6			
ArmaSound system AF (MC): ArmaFlex with metal jacket/cladding, layer build up										
System A	1					2				3
System B	1				3	2				4
System C	1		2		4	3				5
System D	1, 2		3		5	4				6
ArmaSound system AF (GRP): ArmaFlex with GRP jacket/cladding, layer build up										
System A	1							2		
System B	1		2					3		
System C	1		2	3				4		
System D	1		2, 4	3, 6		5		7		
ArmaSound system AG (MC): ArmaGel with metal jacket/cladding, layer build up										
System A		1		2					3	
System B		1		2					3	
System C		1, 2		3					4	
System D		1, 2, 4		3, 5						6
ArmaSound system AG (GRP): ArmaGel with GRP jacket/cladding, layer build up										
System A		1		2				3		
System B		1		2				3		
System C		1, 2		3				4		
System D		1, 2, 4		3, 5				6		

Thermal spacers may be required under rigid cladding materials

If ArmaSound components are used in conjunction with other non-Armacell insulation products, consult Armacell Energy

Appendix B - Acoustic System Temperatures

ArmaSound Industrial Systems are constructed from multiple layers and various thicknesses of different Rigid insulation materials transfer sound well and do not provide effective acoustic attenuation.

The acoustic flexibility of the layers within ArmaSound Industrial Systems will vary with temperature. The acoustic service temperatures of component layers must be respected to ensure that the system will perform as designed throughout its intended operational temperature range.

Tables B.1 and B.2 summarise the service temperature ranges which must be observed for the system components.

Note: The acoustic service temperature range is based upon the material's ability to provide an acoustic benefit and should not be confused with the product service temperature range which is based on its ability to provide a thermal benefit.

Table B.1 Minimum and maximum service temperatures for Armacell products when used as acoustic components of an ArmaSound Industrial System

Product	Minimum temperature	Maximum temperature
LT/ArmaFlex Industrial	- 20°C (-4°F)	+110°C (230°F)
HT/ArmaFlex Industrial	- 40°C (-40°F)	+125°C (257°F)
HT/ArmaFlex Industrial IMO	- 40°C (-40°F)	+125°C (257°F)
ArmaSound RD240	- 20°C (-4°F)	+85°C (185°F)
ArmaSound Barrier E	- 20°C (-4°F)	+65°C (149°F)
ArmaSound Barrier H	- 20°C (-4°F)	+85°C (185°F)
Arma-Chek Mastic	- 40°C (-40°F)	+120°C (248°F)
Arma-Chek R	- 50°C (-58°F)	+100°C (212°F)

Table B.2 Minimum and maximum service temperatures for Armacell products used as thermal insulation components beneath an ArmaSound Industrial System

Product	Minimum temperature	Maximum temperature
LT/ArmaFlex Industrial	- 50°C (-58°F)	+110°C (230°F)
HT/ArmaFlex Industrial	- 50°C (-58°F)	+125°C (257°F)
HT/ArmaFlex Industrial IMO	- 50°C (-58°F)	+125°C (257°F)

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As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With more than 3,300 employees and 27 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.

For more information, please visit:
www.armacell.com/energy

