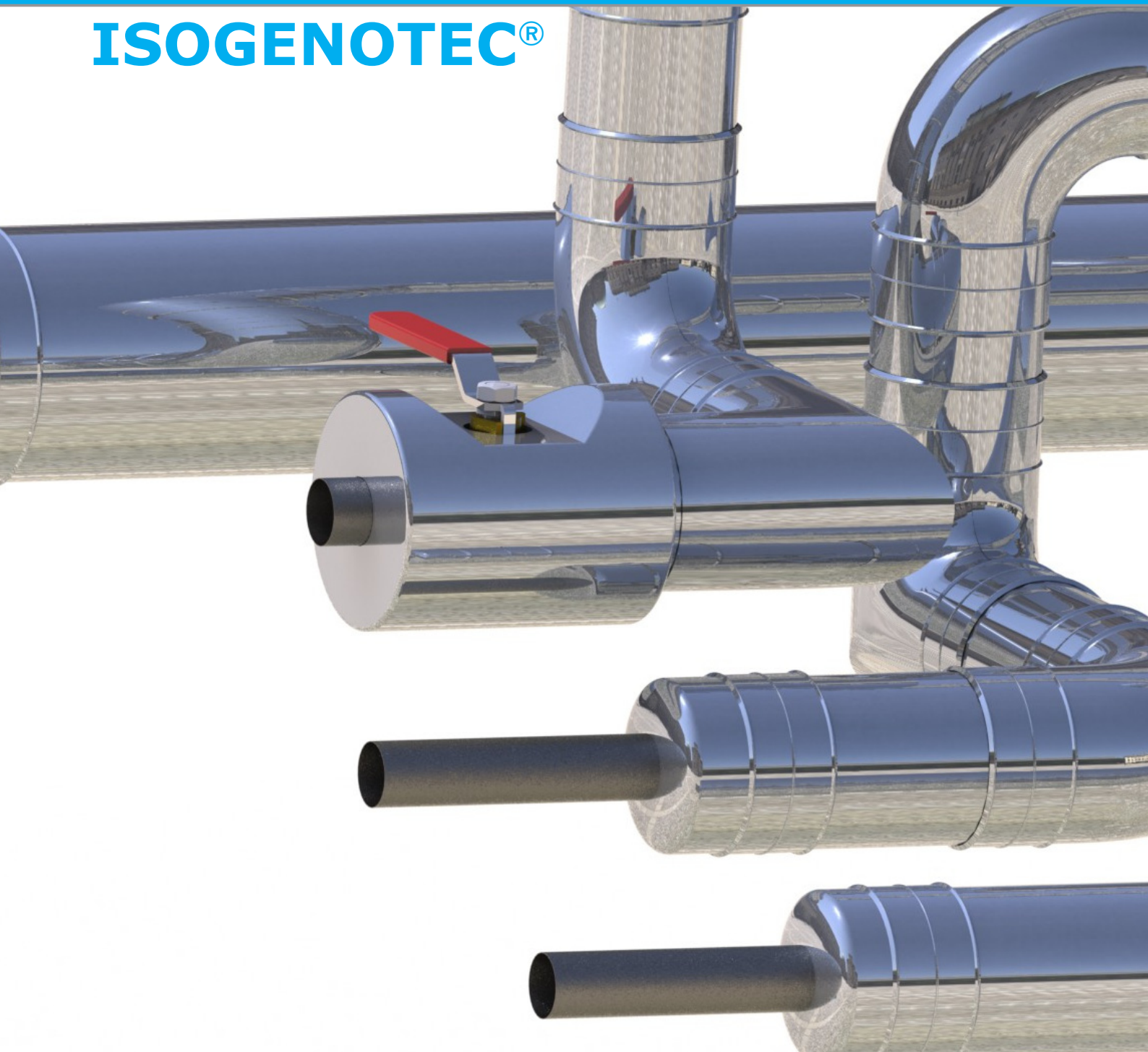
Application of

SILVERCLADD®

ISOGENOTEC®



Content

Document Specifics

The aim of this page is to explain some of the drawings, colors used and why, as well as some of the existing limitations.

• Great care and effort has been employed to ensure this document's accuracy. Its purpose and intent is only to provide the user with guide-lines on how this system could be installed.

• All the dimensions of pipes, insulation, tapes, and others, may not represent their real-life sizes, unless specifically stated.

• The document will contain both 3D drawings and real pictures, depending upon the amount of detail required.

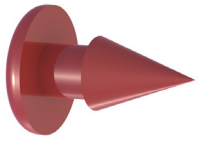
• There will be no Figure (drawing) index. Their numbering system will only be relevant to the chapters or pages they support.

• When other sources are used or cited, they will be referenced as footnotes.

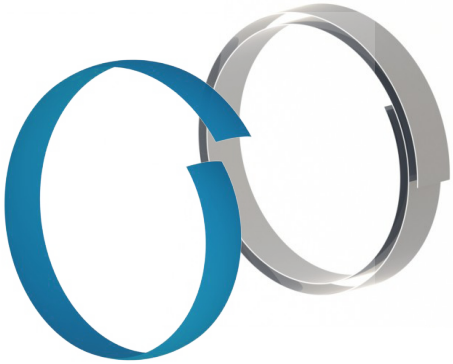
• Pipe: although it looks like a metal pipe, it represents all types of pipe-materials, metallic and nonmetallic.

• Insulation: its color was randomly chosen. It makes no reference to any particular type of insulation.

• Rivets: some are colored in *red,* for a better visual representation. Their standard colors are grey and white.



• Tapes: in most drawings, the circumferential tapes are shown opened to highlight the amount of layers that may be required. Some of them are also colored in *blue* to be easily identifiable within the illustration. The color of the real tape is silver.



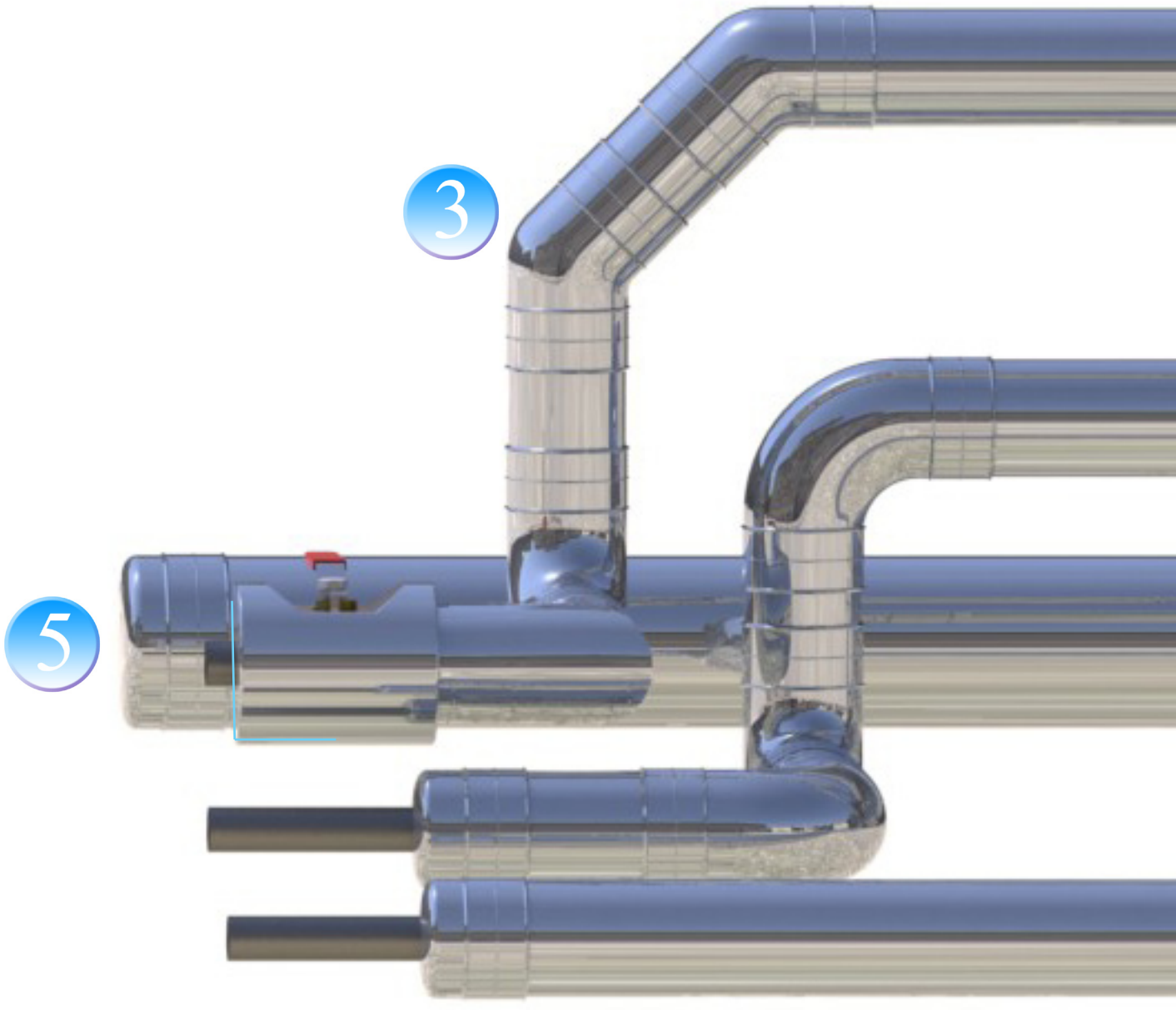
• Jacket = clad, cladding, covering material.

• Please be aware that this document only concentrates on the installation best practices but it does not specifically consider any particular installation site. The decision of whether to use or not this system must incorporate many other particular aspects.

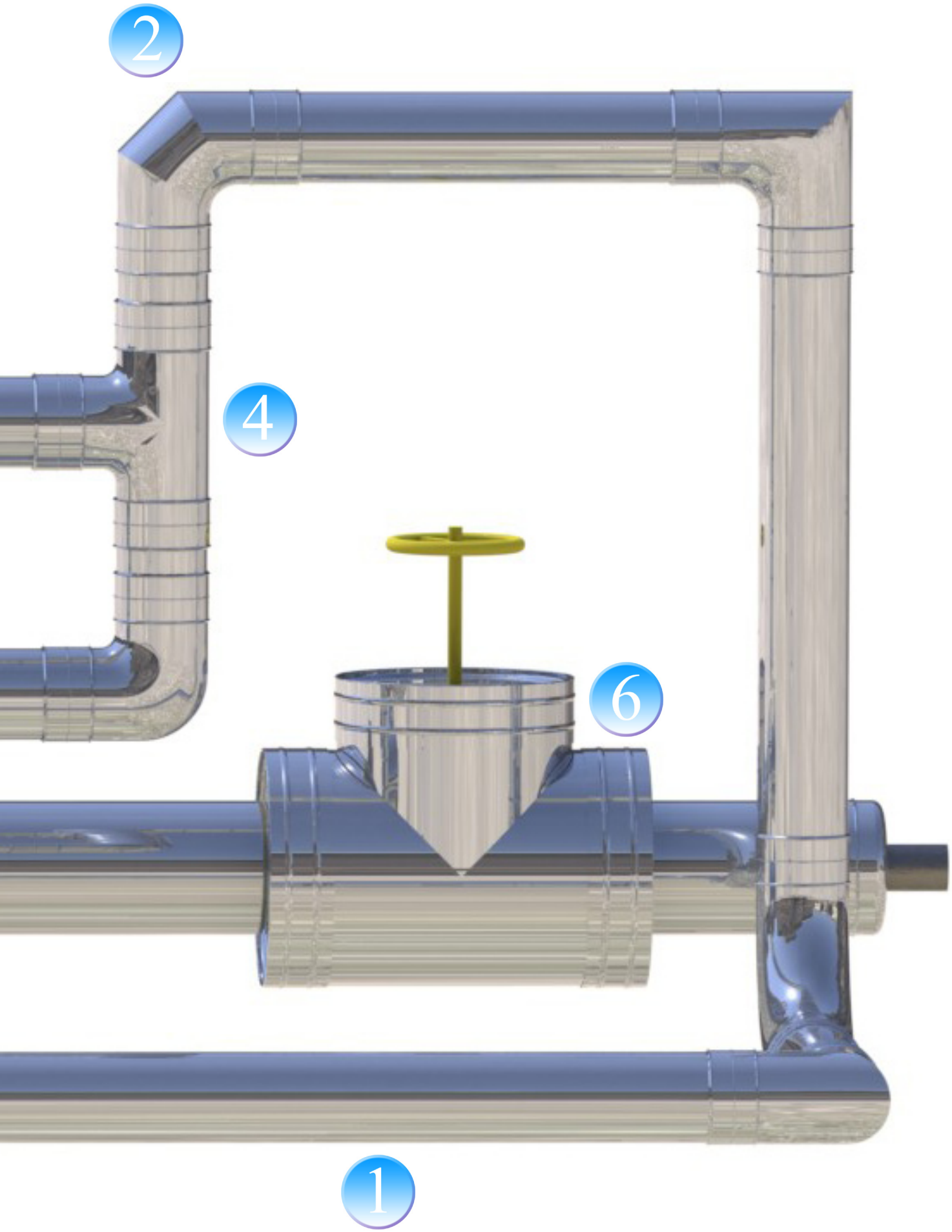
Components of a System

An average system* contains the following parts:

1. Straight Pipes
2. 90° Elbows
3. 45° Degree Elbows
4. T-pieces
5. End-Caps
6. Valves and Flanges



*The word 'system' refers to a basic installation.


2
4
6
1

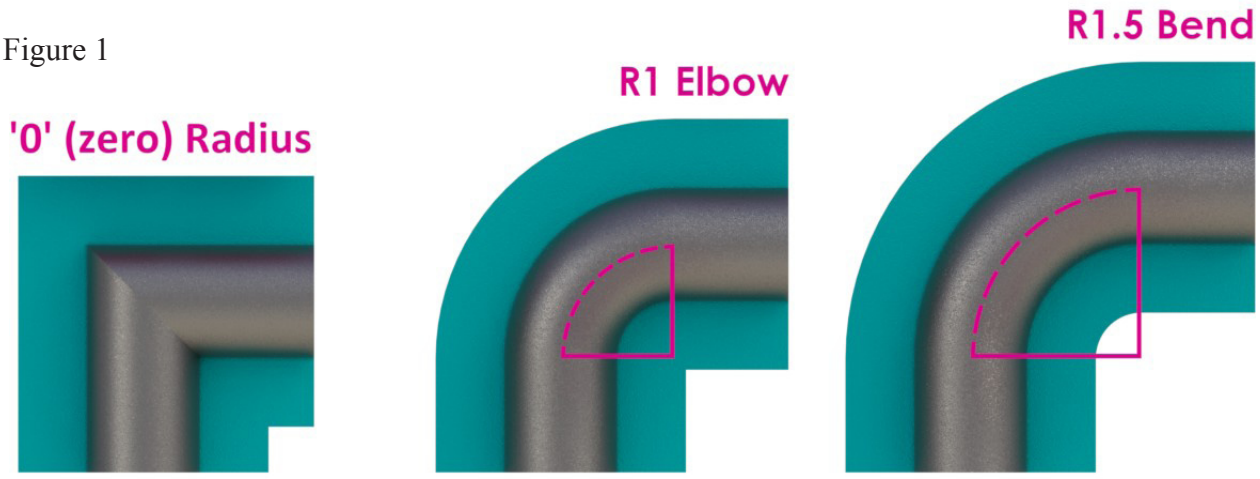
Elbows & Bends details

Single-Fit Covers

What is the right fitting? This depends on several factors. Theoretically, the best fitting is one that creates no void gaps between the fitting and insulation; snug-fit. However, this may become impractical in the real world. Product availability, project urgency, man-power and geographical location are just a few examples of elements to consider when selecting the appropriate fittings.

To understand the elbows/bends, the importance of radius must be firstly explained. Figure 1 displays the vital role that their *radius* plays. Three elbows/bends are constructed with different radiuses(1), however, having the same pipe and insulation size. The aim is to support the fact that each of these products require an individual cover.

Figure 1

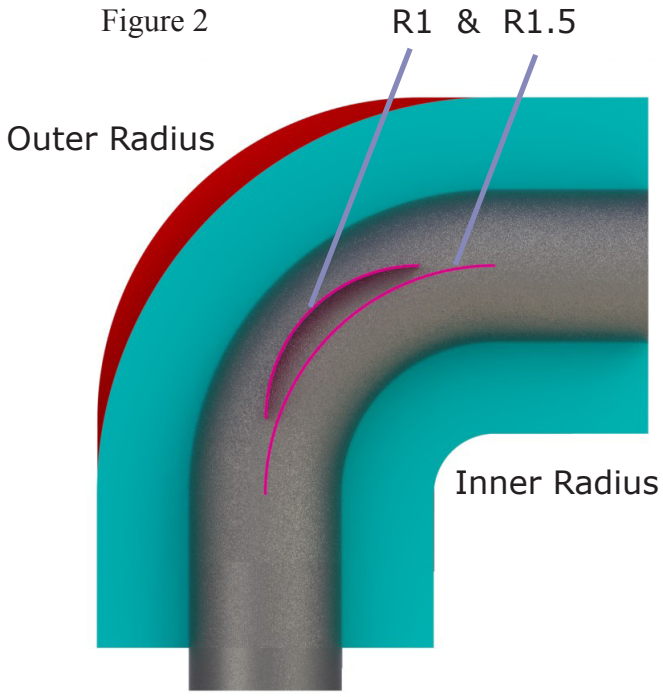


Multi-Fit Covers

There are situations where a multi-fit cover may be desired, for example when a 'live' pipe cannot be stripped off to find any of the sizes of PIR(2). In this case, only the final OD can be measured(3) therefore a multi-fit cover may be desirable.

A multi-fit cover takes the inner radius, of the long radius (1.5R), and the outer radius ,of the short radius (1R), to accommodate both alternatives (see Figure 2).

Figure 2



(1) A radius is "a straight line between the centre of a circle and any point on its outer edge; the length of this line" (Oxford Dictionary)
(2) PIR - abbreviation of Pipe, Insulation and Radius. Not to be confused with Polisocyanurate.
(3) Experienced contractors may be able to identify if the object has a long or short radius by looking at the throat and back of the elbow.

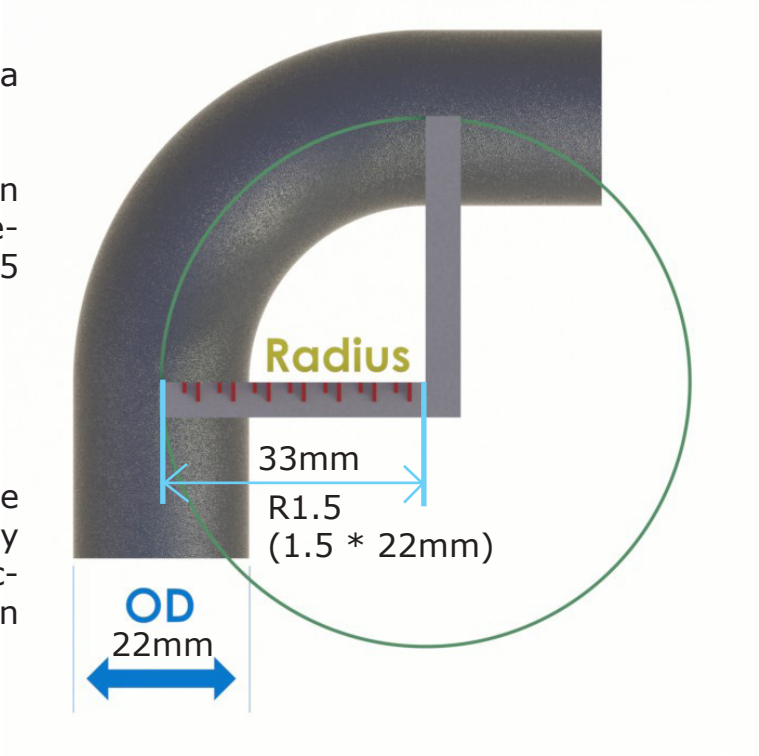
The meaning of R:

Radius (R) is always expressed as a measure of the pipe OD(1) or NB.

When R = 1 it means the radius of an elbow is equal to the pipe OD. Likewise, if R = 1.5 it states that R is 1.5 of the OD.

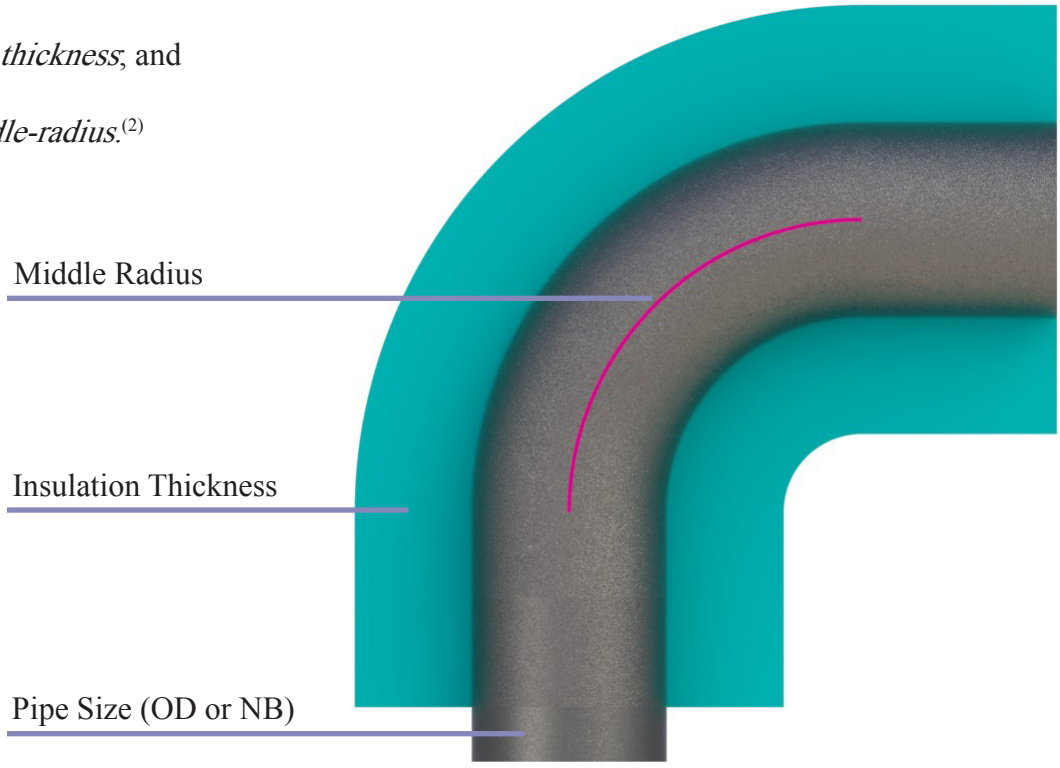
R1 = Pipe OD
R1.5 = Pipe OD * 1.5

Following the above principles, one would be able to determine the R by using a square measuring tape, placing it on the welds of the elbow, then comparing it to the pipe OD.



There are three important elements required when *ordering* elbows/bends (or fittings):

1. *Pipe thickness*;
2. *Insulation thickness*; and
3. *Pipe middle-radius*.(2)

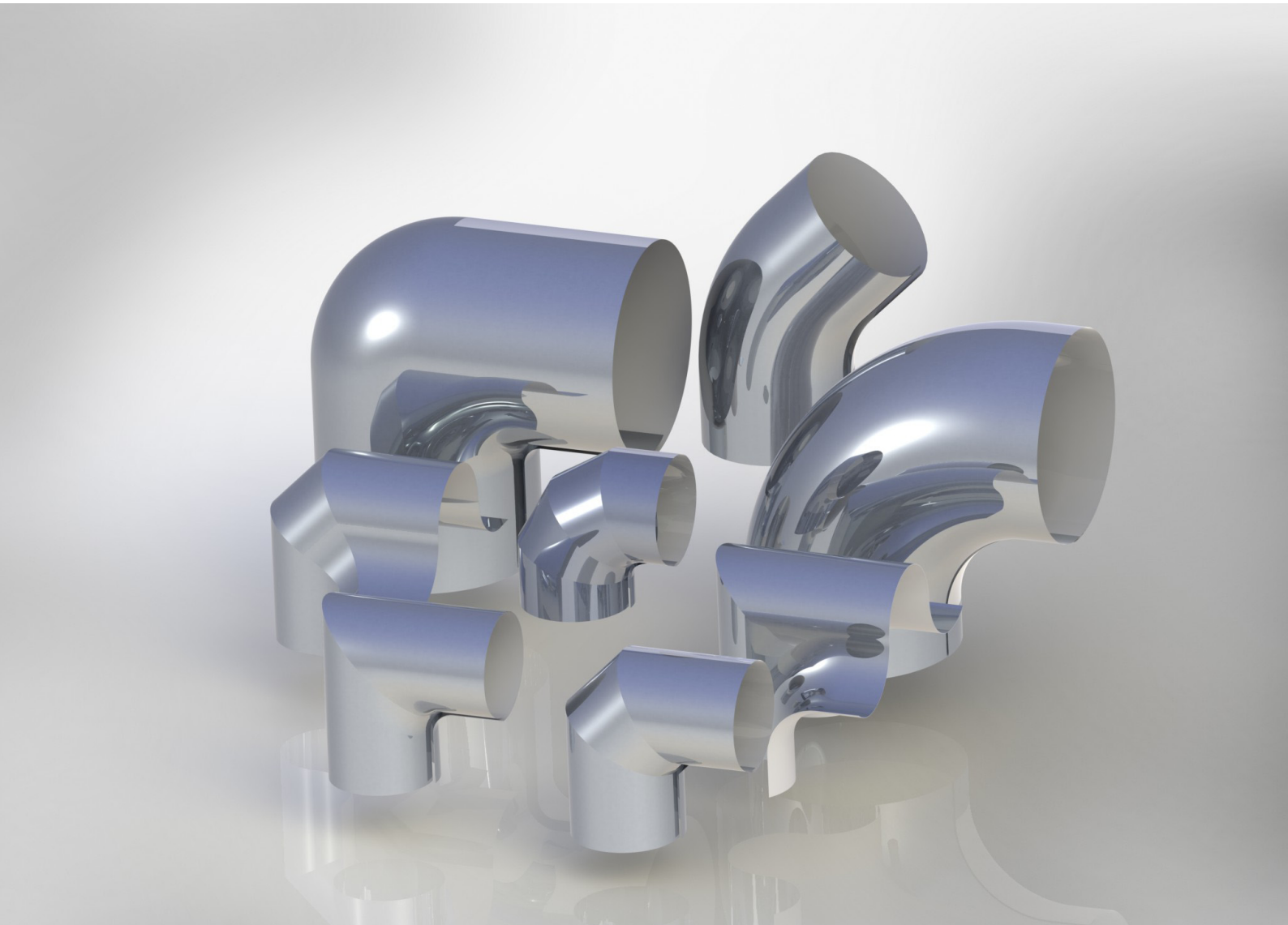


(1) OD stands for Outside Diameter. NB stands for Nominal Bore - internal diameter of a pipe.
(2) Note: when we talk about Radius, we always talk about the pipe-radius, never about the insulation. Radius has never anything to do with the insulation thickness. We also do not say 'middle-radius', but just 'radius' expecting that we are talking about the middle-radius.

90° Elbows & Bends

After the straight pipes, elbows are the next most common element of any mechanical system. They come in various sizes and shapes, therefore, care must be exercised to ensure the right selection is made. Attention must also be paid to the colloquial terms used in different geographical locations. For example, in Australia, tradesmen make a difference between an elbow and a bend, signifying a short and long radius products, respectively. In the UK the 45 degree bends are referred to as *sets* and in North America segment elbows are referred to as *gore* elbows. Given these subtle naming differences, it is always recommended to specify the radius (R1, R1.5, etc) and the degree (for example 90° or 45°) of the required products.

For this installation document, the words elbows and bends may be used interchangeably with no particular reference to the radius. When the radius matters, it will be clearly specified to avoid any confusion.

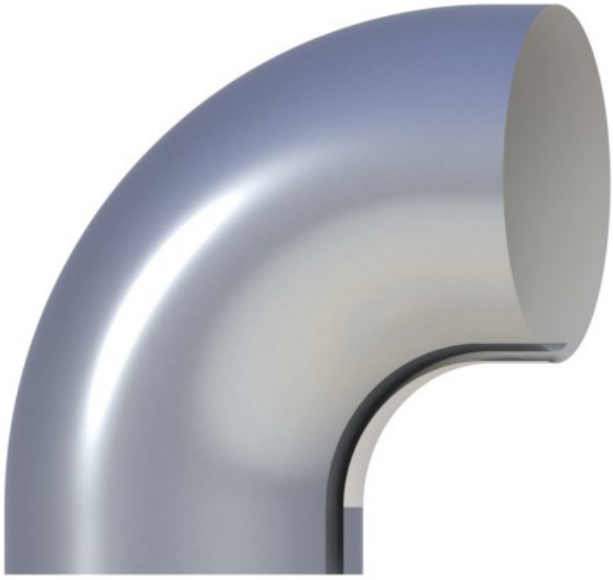


Types of elbows

Type: 90° Long Radius Bends (R1.5)

Purpose: All purpose

German notation: ‘S’



Type: 90° Short Radius Elbows (R1)

Purpose: Suitable to create a round-look

German notation: ‘W’

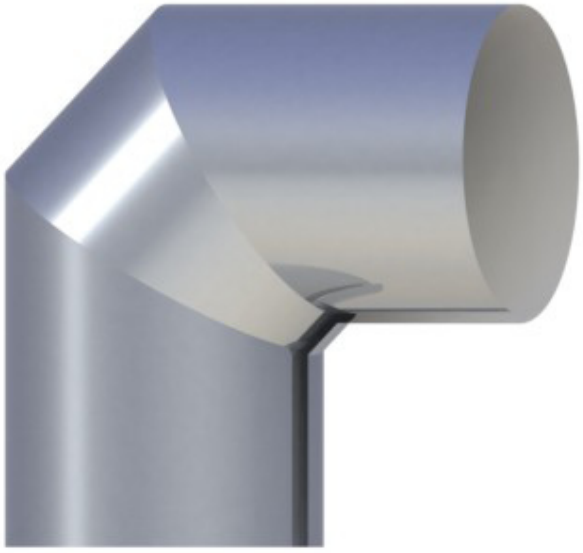
Type: 45° Elbow

Purpose: Suitable to create a round-look

Types of elbows

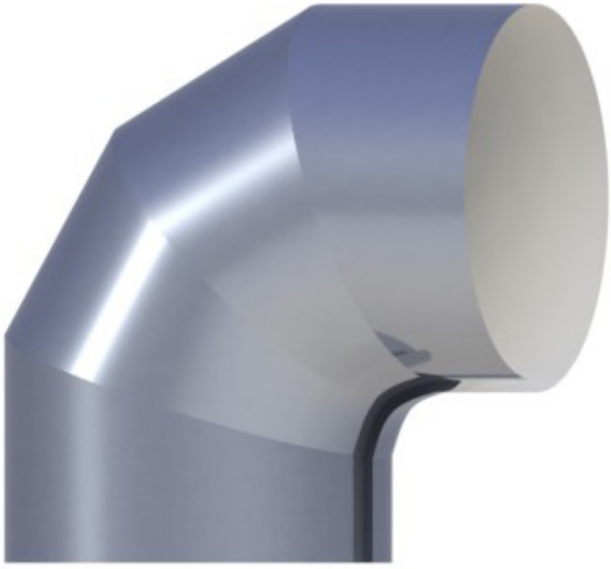
Type: 90° Multi-Fit One Segment Elbows (R1 & R1.5)

Purpose: Suitable for creating a segment-look



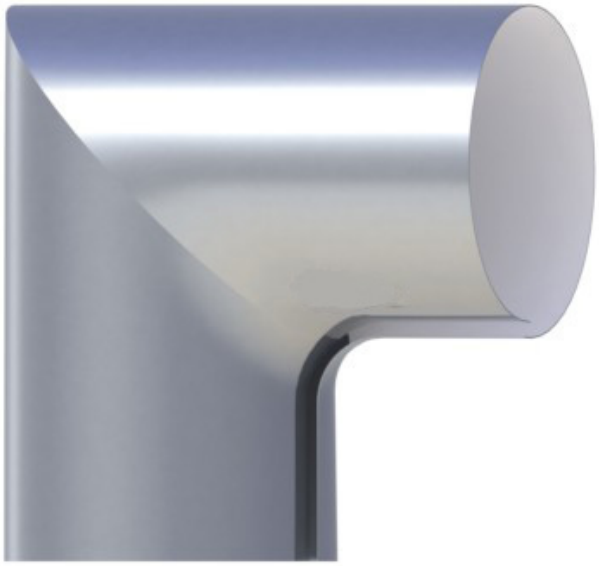
Type: 90° Multi-Segment Elbows (R1.5)

Purpose: Suitable for creating a segment-look



Type: 90° Sharp Elbows (R0 & R1)

Purpose: Suitable for sharp elbows, especially when rigid insulation is being installed. These are most commonly found in smaller pipe installations where the insulation is diagonally cut only once to form an elbow. In this case, the insulation forms a very sharp corner that may be difficult, without adjustment, to cover with *round* elbows.

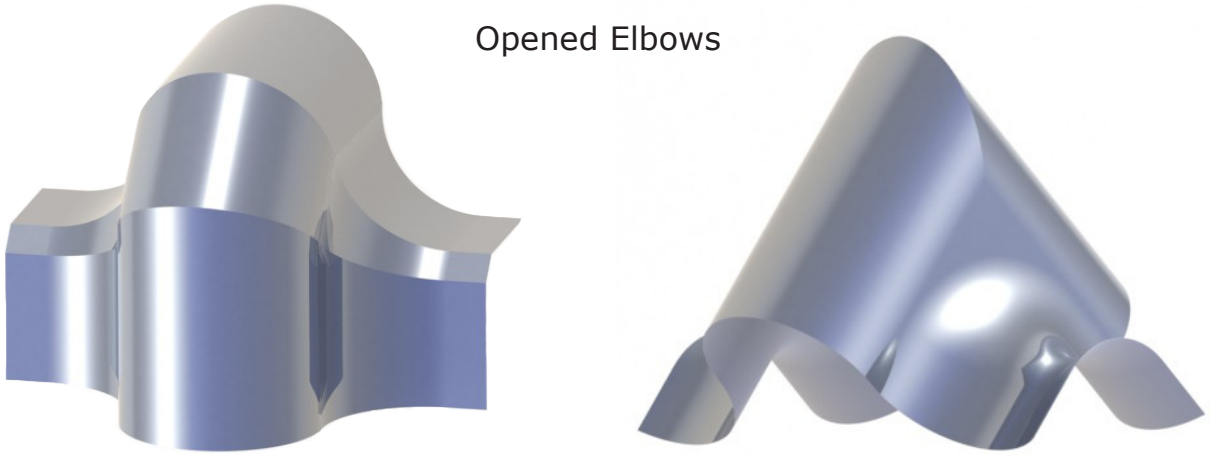


How to Secure the Elbows

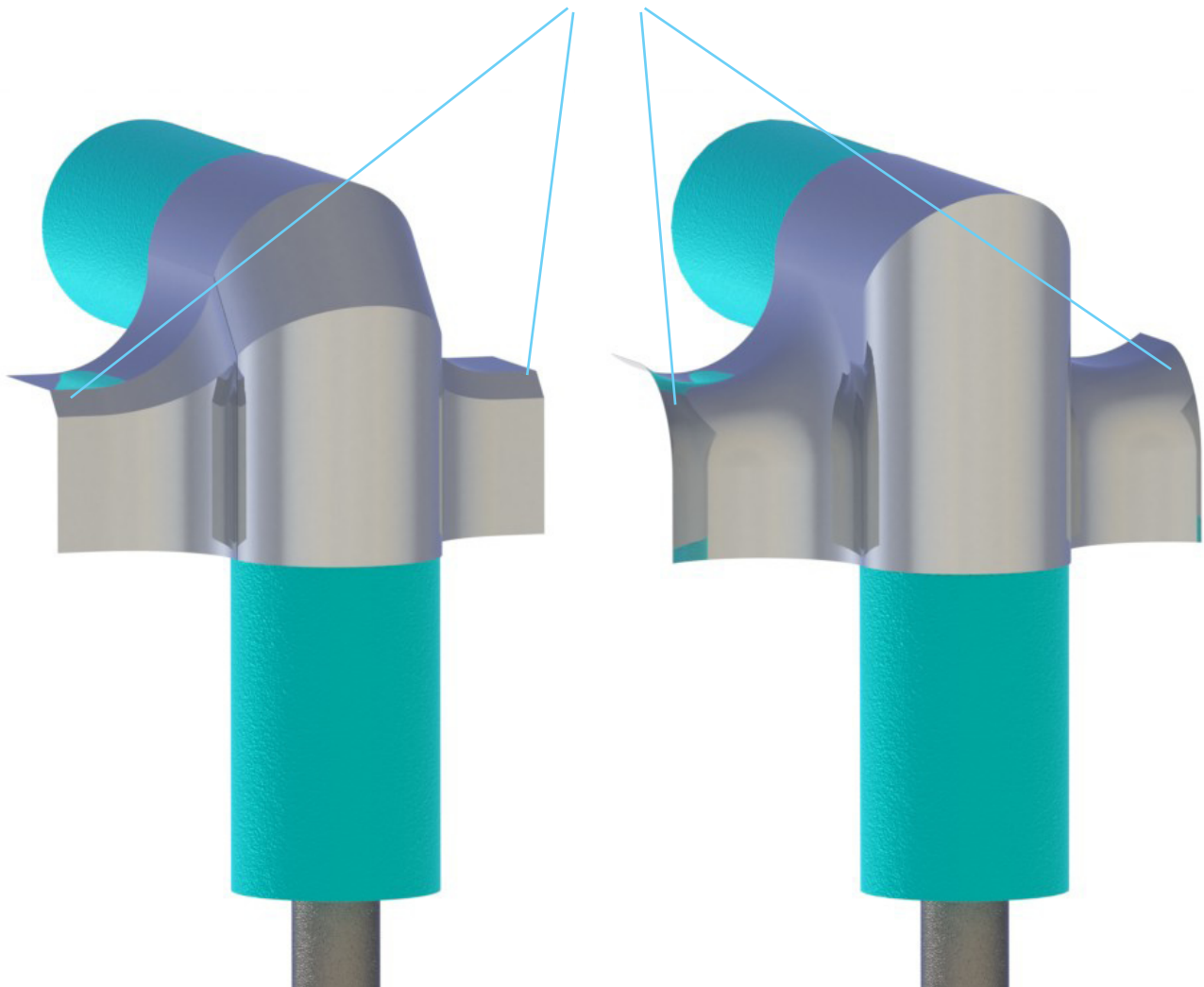
The one-segment, corner-elbows and a selected range of the round elbows are provided in an opened form. To install these elbows, one must place the elbow over the insulation and then press the crest of the *wings* to snap them into place.

Note: these elbows must be pressed against the insulation to snap into place as the *wings* are sturdier.

Opened Elbows



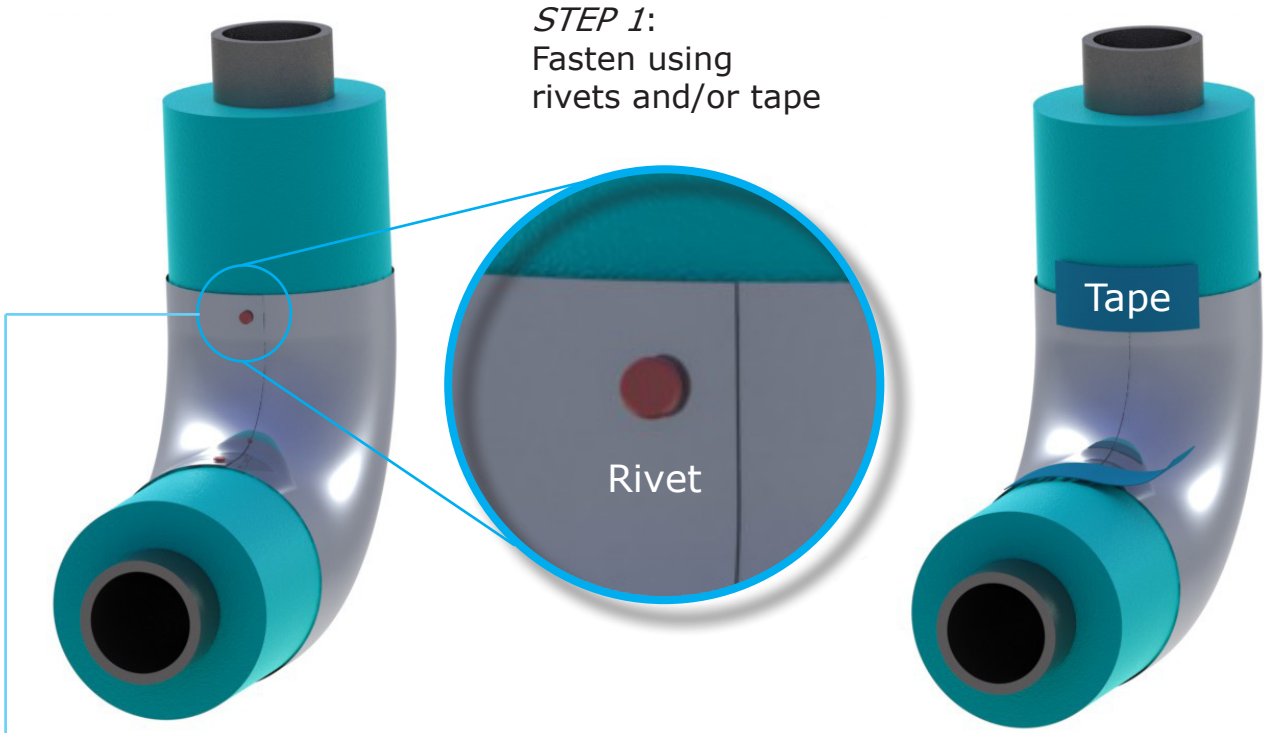
Wings - Press Here

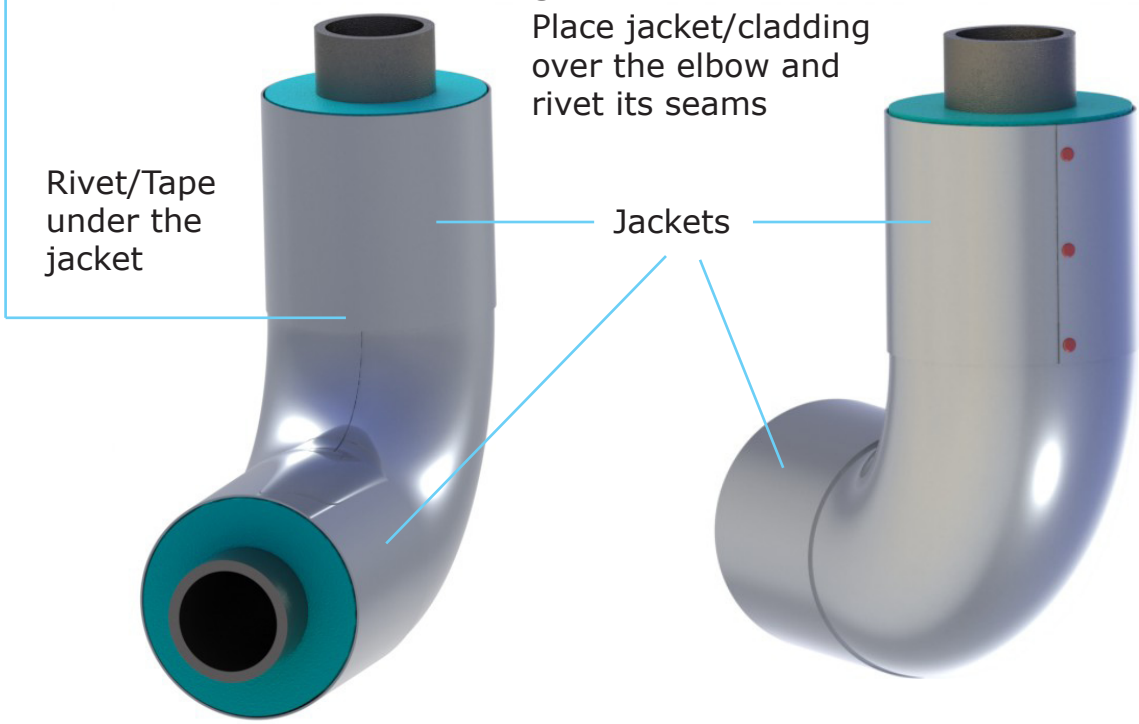


How to Secure the Elbows

Indoor Application

There is a lesser requirement for indoor applications. That is, only mechanical fastening is a prerequisite, sealing the joints considered necessary only if there is an opportunity for liquids to enter the system. All seams must be taped if the jacket is also used as a moisture barrier.

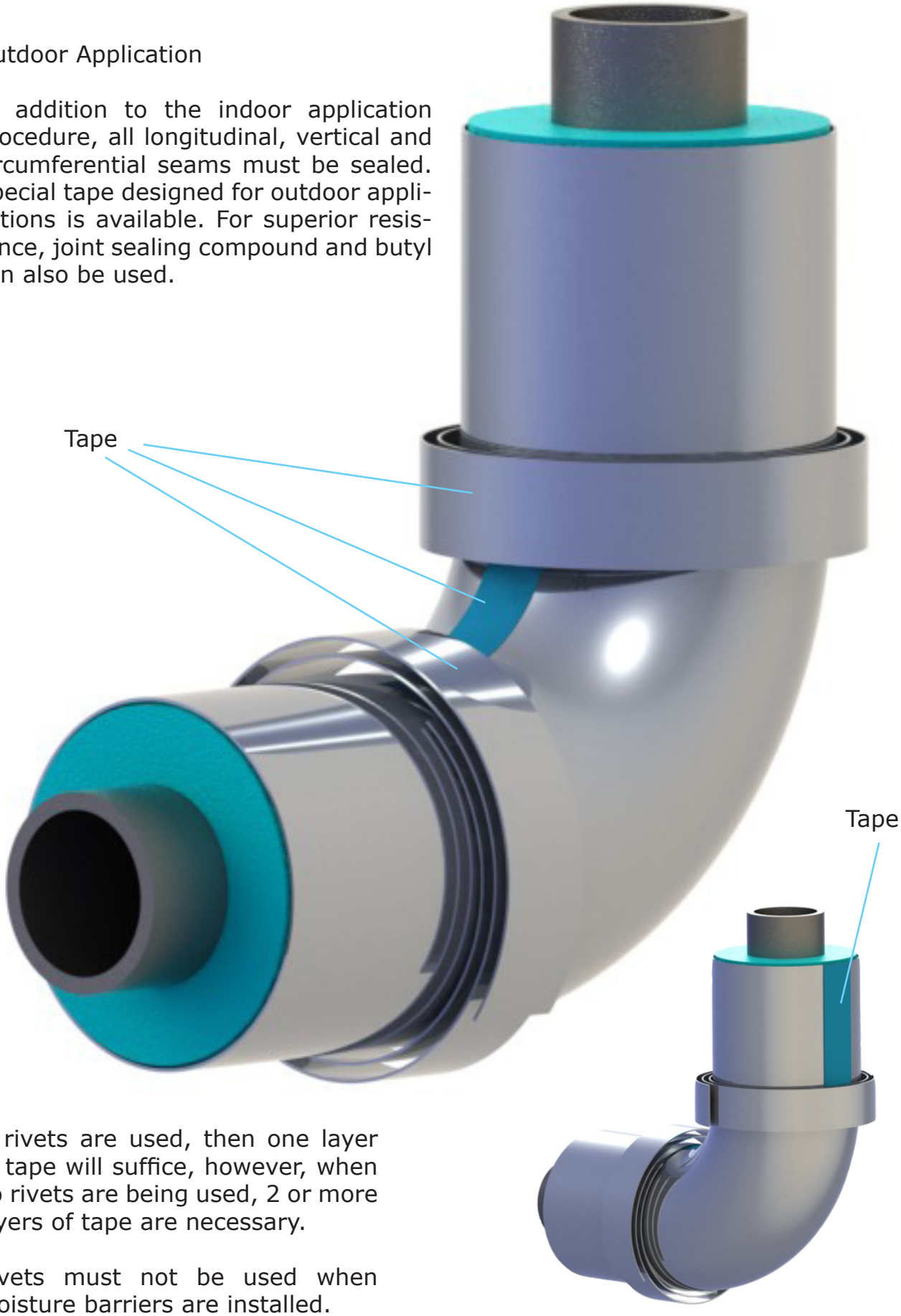




How to Secure the Elbows

Outdoor Application

In addition to the indoor application procedure, all longitudinal, vertical and circumferential seams must be sealed. Special tape designed for outdoor applications is available. For superior resistance, joint sealing compound and butyl can also be used.



If rivets are used, then one layer of tape will suffice, however, when no rivets are being used, 2 or more layers of tape are necessary.

Rivets must not be used when moisture barriers are installed.

Note: The tape applied in the throat and back of the elbow has been colored in blue for an easy identification.

How to Secure the Elbows

Steps to install the elbows/bends on a vertical pipe:

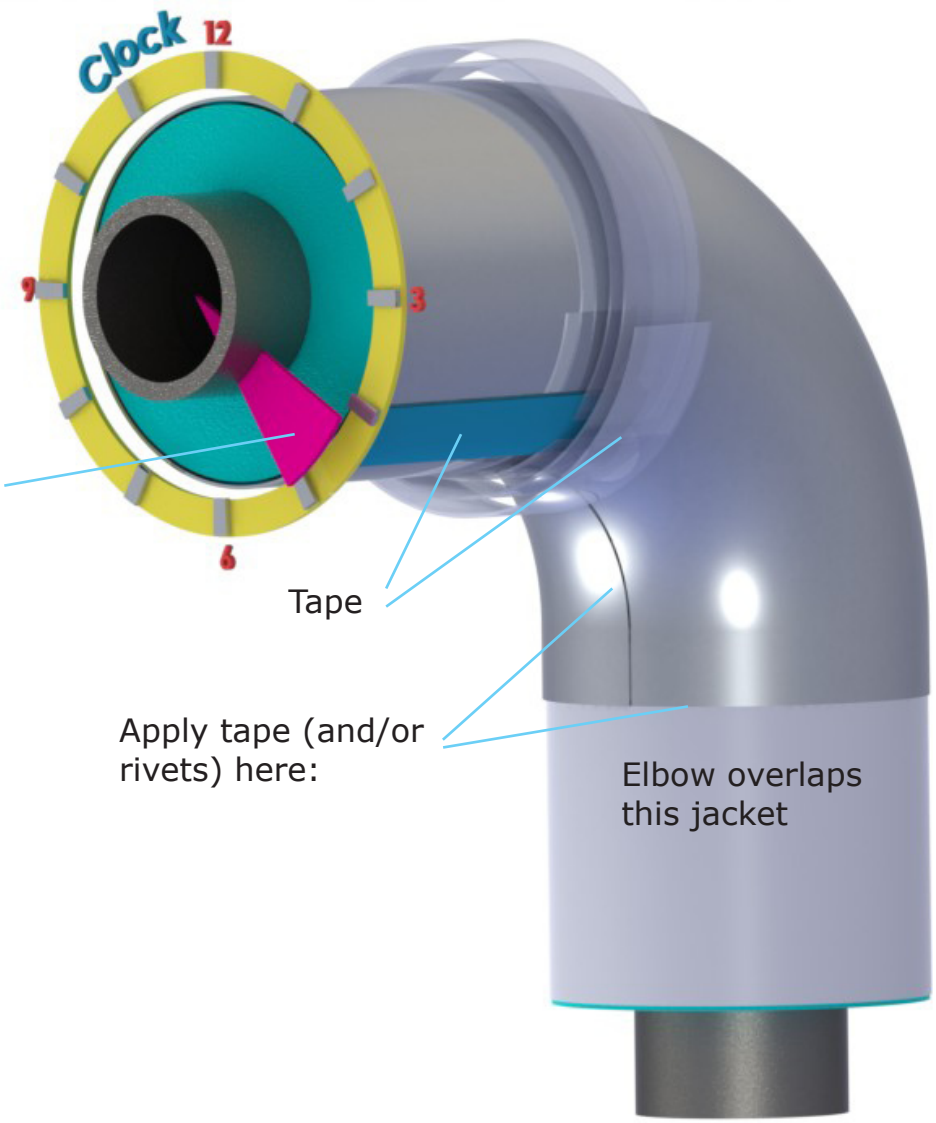
1. Vertical pipes - elbows must overlap all vertical jackets, to produce a natural watershed system.
   - Horizontal pipes - elbows can overlap or be overlapped. Attention must be paid if the pipe is slightly inclined.

2. Install the jacket on the vertical pipe, all the way up to the elbow.

3. Place the elbow over the insulation, and over the vertical jacket, and squeeze it to achieve a tight fit.

4. Once you achieve a tight fit, hold the elbow in place with a stripe of tape, placed in the throat of the elbow, or use some strapping(1).

5. Secure the elbow with rivets and tape. If the jacket is intended to function as a moisture barrier then do not use rivets, only tape. In this case, ensure the tape is applied in minimum two layers. Metal banding may also be used.

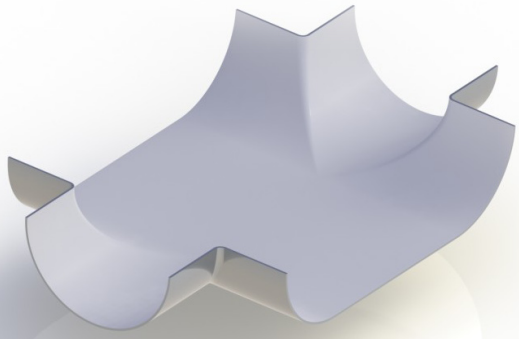


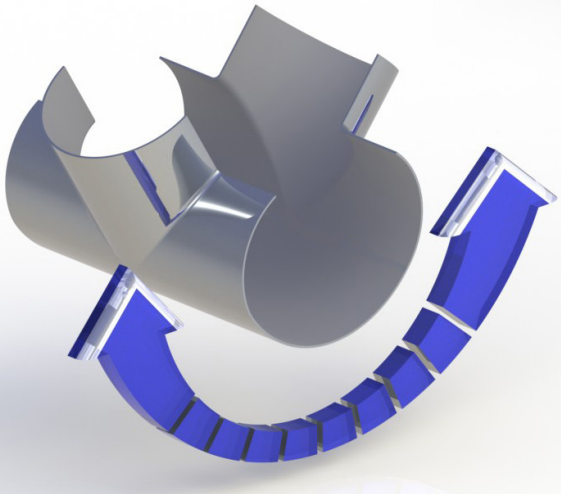
(1) Strapping recommendation: lightweight polypropylene with plastic buckle (so it does not scratch the part).

T-Pieces

Preformed T-pieces are used at pipe junctions. Their overlapping is dictated by the horizontal or vertical position. Watershed must be achieved at all times. Therefore, if the end of the T-piece will be installed on a vertical pipe, it must always be placed over the vertical jacket.

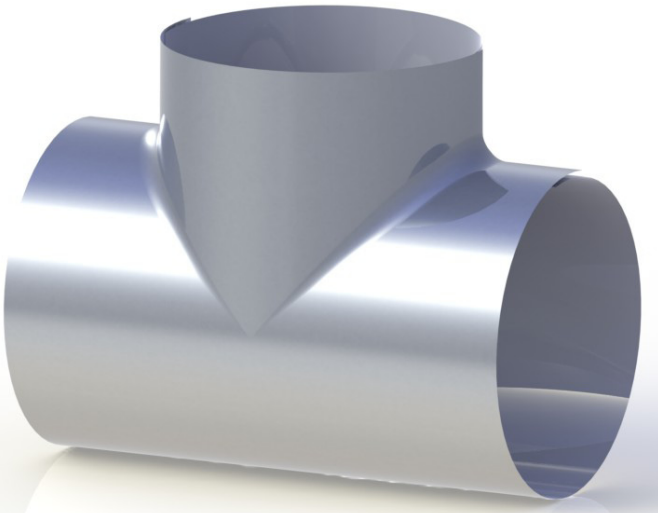
T-pieces are supplied in an opened form





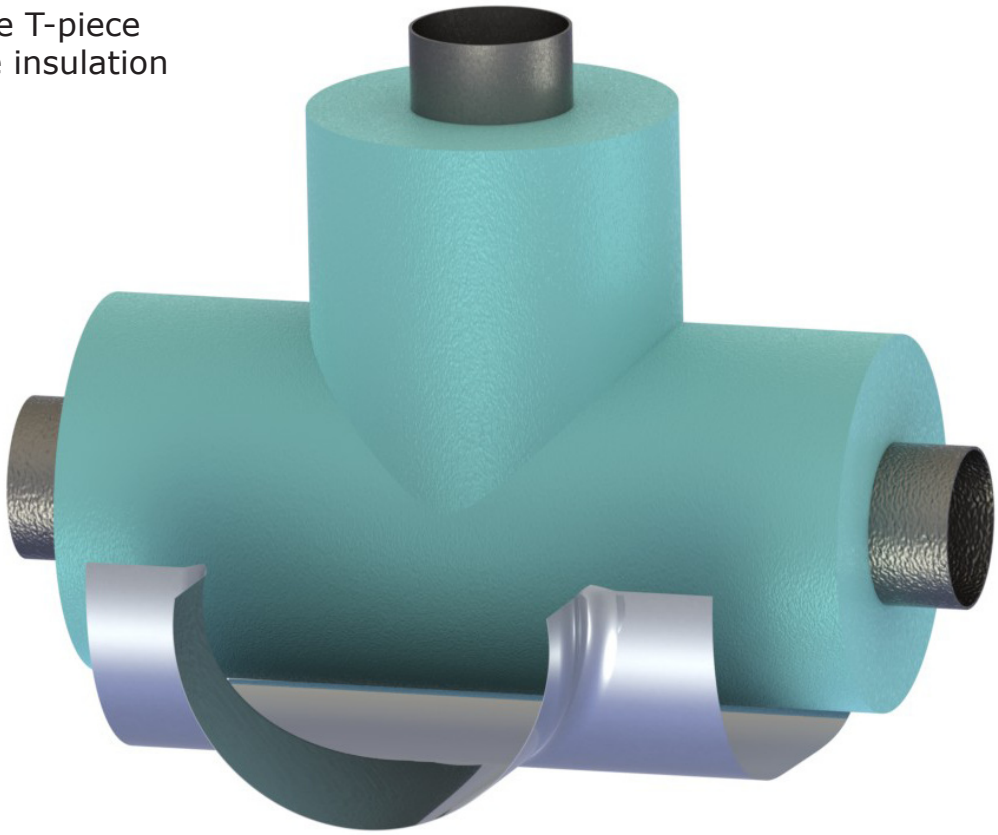
T-piece pressed around the insulation

Final shape, when wrapped around the insulation

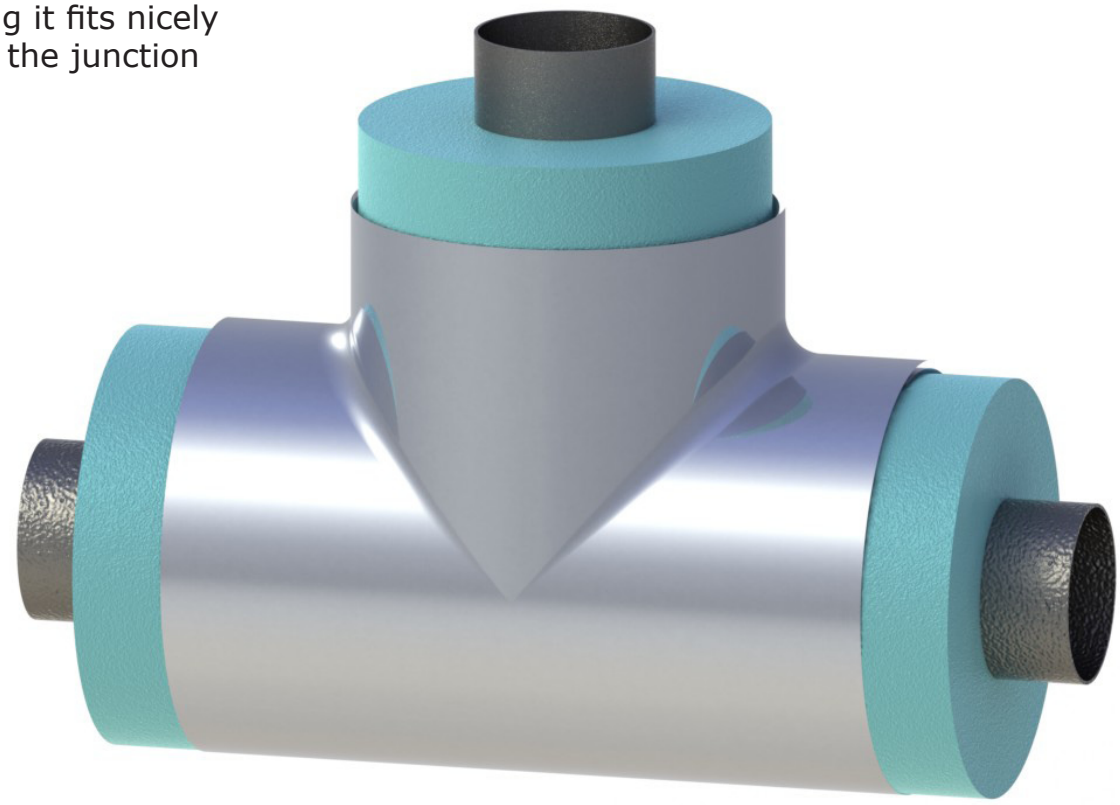


How to Secure the T-pieces

Position the T-piece around the insulation



Push it into place, ensuring it fits nicely around the junction



Indoor Application of T-Pieces

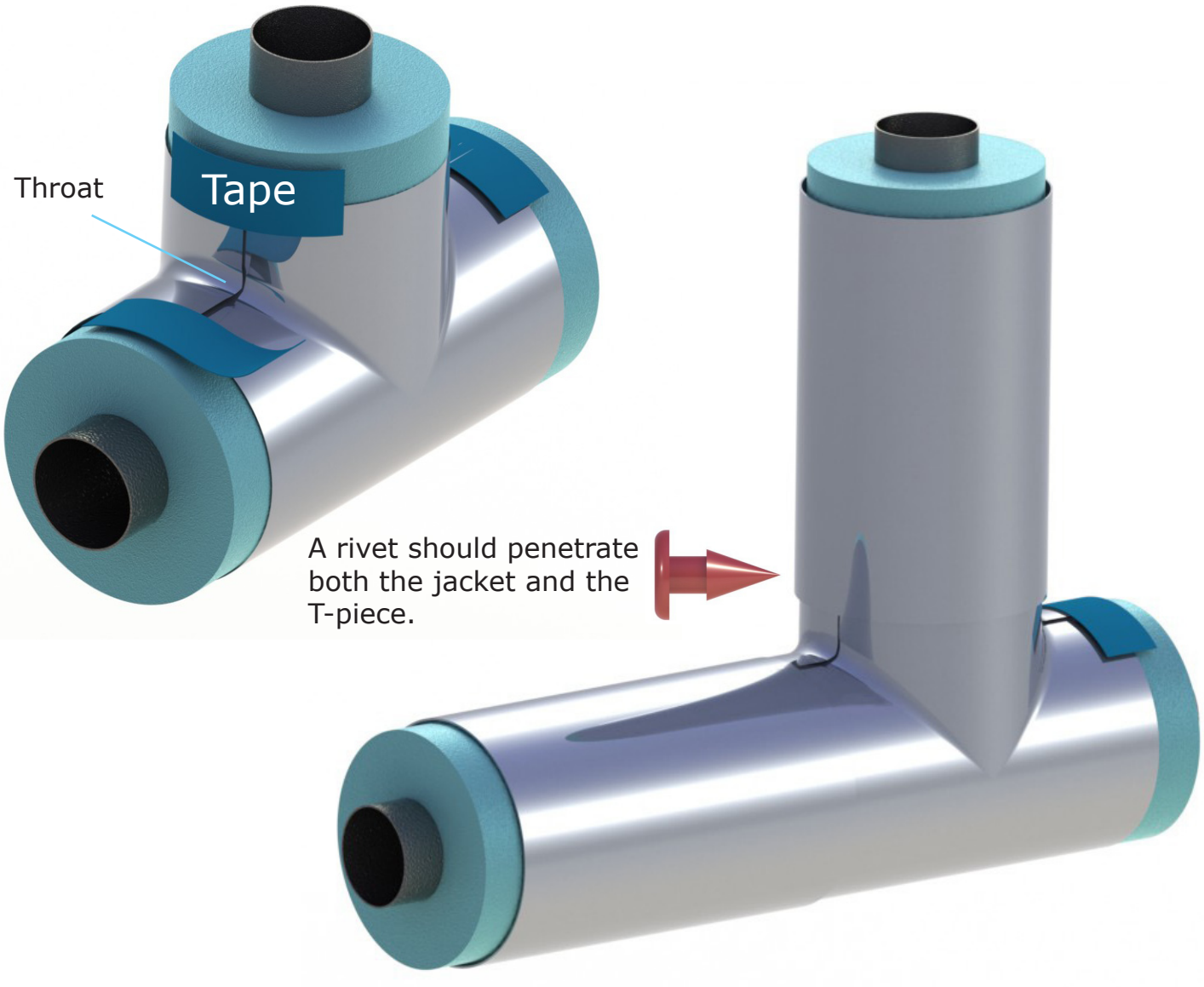
1. Examine the surrounding area. Overlapping should be created *away* from the foot traffic/walkways (if possible); for a pleasant esthetical appearance.

2. Place the T-piece around the insulation.

3. Apply strips of tape (or rivets) on both edges, whilst pressing in the throat to achieve a tight fit. The tape must be close enough to the edge so the cladding jacket will fully cover it, when installed.

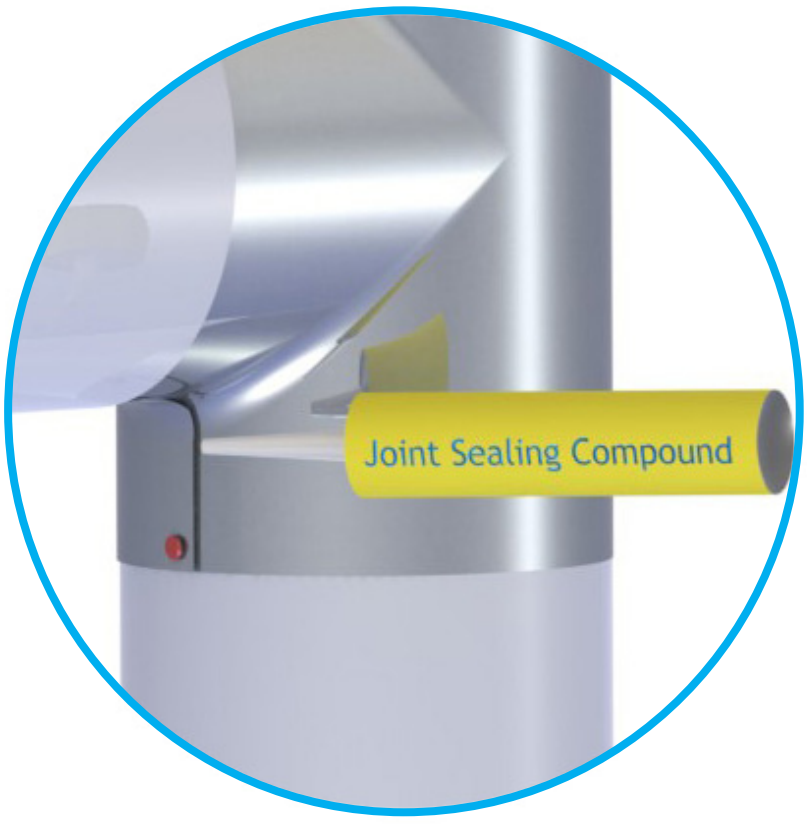
4. The jacket will then be applied over the T-piece, as per jacket installation practices (see page 30).

5. Whilst the tape is only meant to hold the T-piece in place until the jacket will overlap, a rivet must also be inserted into the jacket-seam, through the T-piece. This will ensure the mechanical fastening/connection between the jacket and T-piece. Again, do not use rivets if moisture barrier products are used.



Outdoor Application of T-Pieces

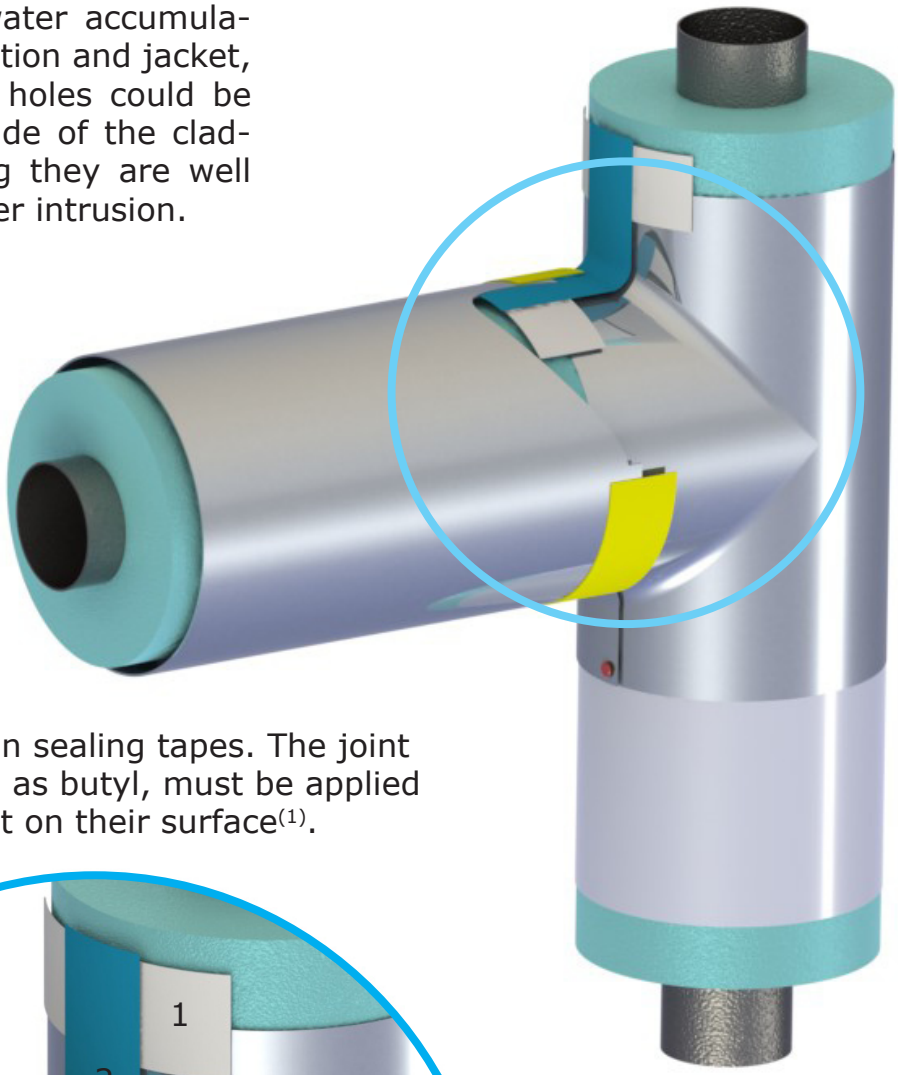
For all outdoor applications, and when water penetration is not desirable (1), the jacketing system must be installed in a 'water-shed' manner. That is, all vertical parts must be installed from the bottom to the top, to create a natural water protection. In addition to mechanical fastening system, all seams must be also sealed with tape, joint sealing compound, butyl or by other products.



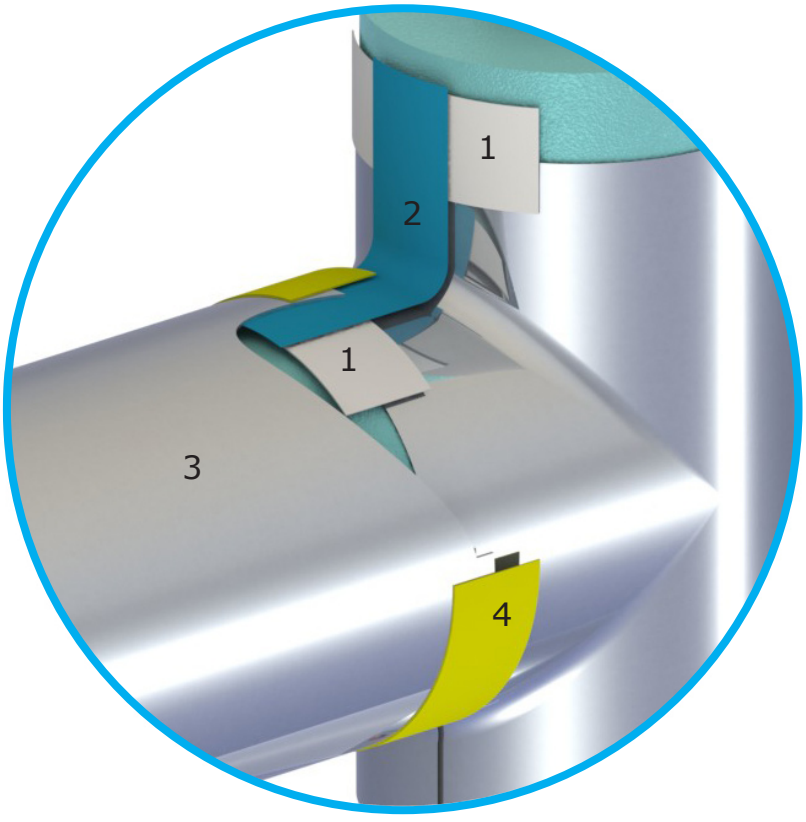
(1) Applicable to the indoor where liquids could enter the jacketing system.
Note: The above figures use different color-shades jackets for a better representation.

How to Secure the T-pieces

All seams must be sealed for all outdoor applications. If there is a concern for any heat build-up or water accumulation, between the insulation and jacket, then some discharging holes could be created on the lower side of the cladding, however, ensuring they are well protected from any water intrusion.



Every seam must contain sealing tapes. The joint sealing compound, such as butyl, must be applied between the jackets, not on their surface(1).



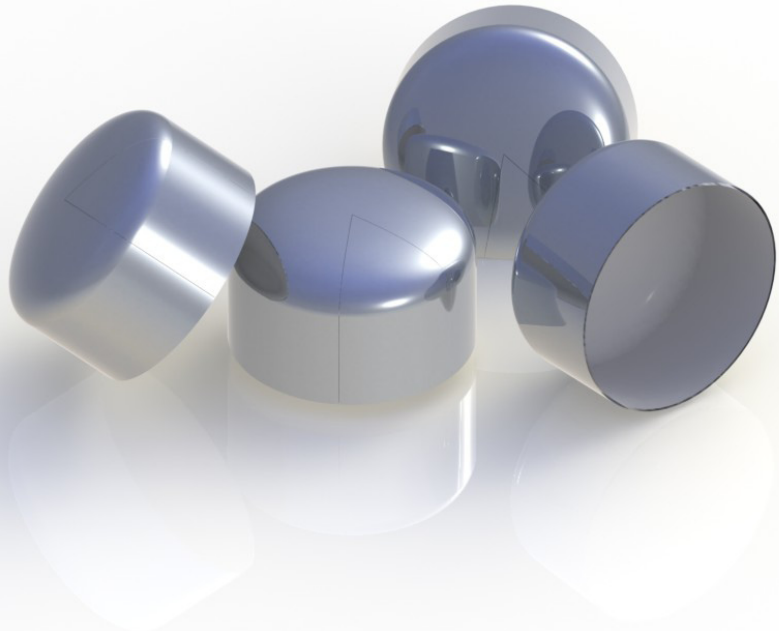
Elements

1. Fixing tape;
2. Sealing tape;
3. Jacket overlapping the T-piece & 1, 2;
4. Sealing tape.

(1) Primary function of joint sealers is to prevent water pentetration, not for mechanical fastening; they are best applied between surfaces, away from UV and dirt exposure. Consult their manufacturer for guidance.

End-Caps

The end-caps are utilized to neatly finish the ends of insulation. Insulation materials should be completely covered, when protection from mechanical and environment abuse is sought. Hence, the end-caps complement the jacketing system for protection and pleasant finish.



Due to the multitude of pipe + insulation thickness combinations, the end-caps are designed to fit multiple sizes. For example, size 60-70mm will fit all the final ODs (pipe + insulation) in this range.

Each end-cap is marked with the maximum and minimum allowance to fit its purposed range; see Figure 1. Figure 2 displays the hole cut to accommodate the pipe, along with a sectional cut, to allow the end-cap overlap to the desired size.

Figure 1

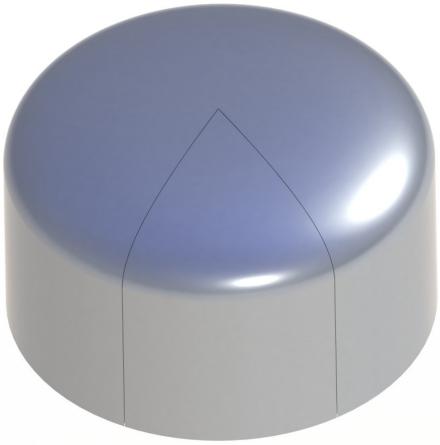


Figure 2

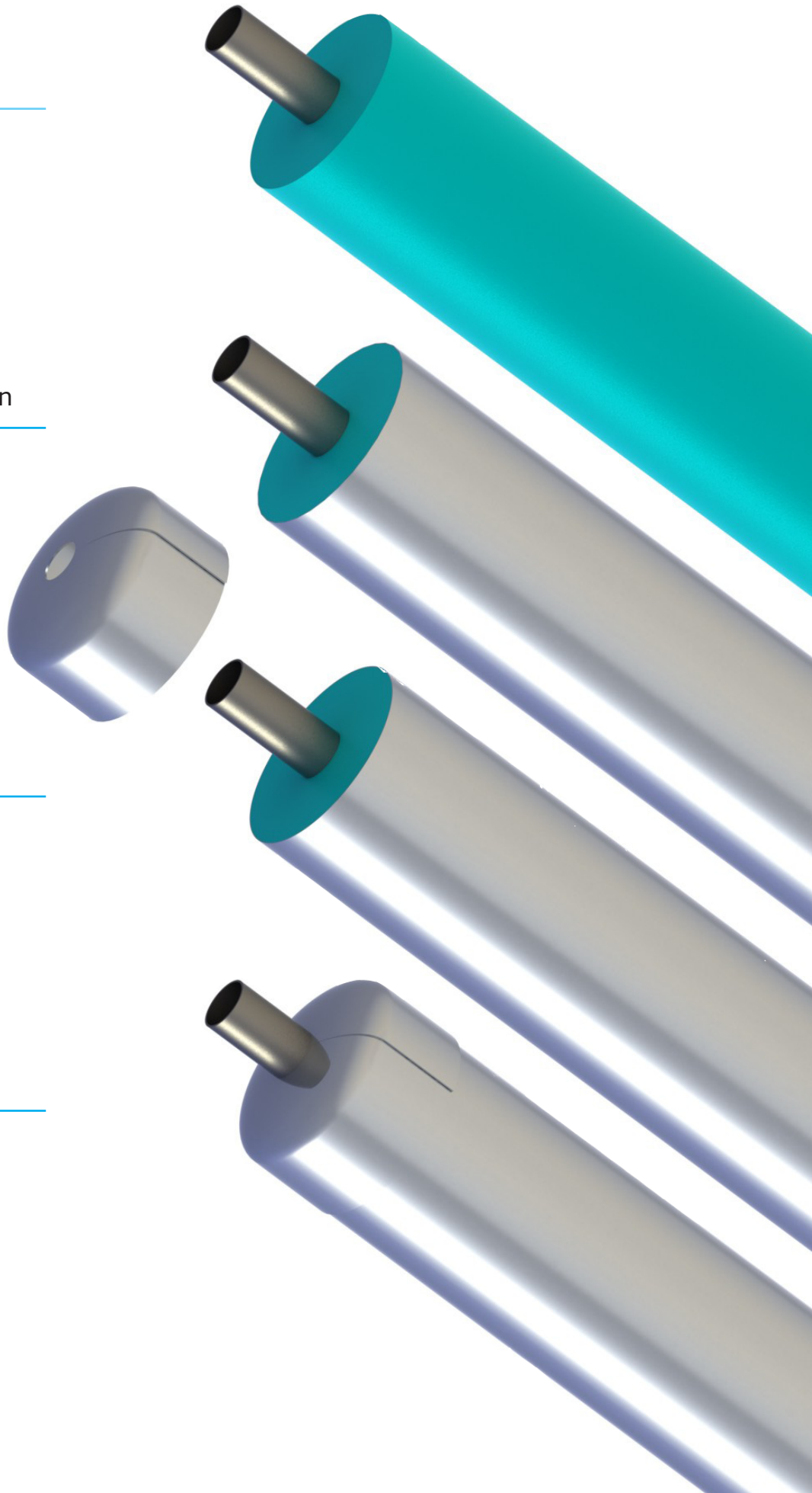
How to secure the t-pieces

Insulated Pipe

Jacket Over Insulation

End-Cap Preparation

Fitted End-Cap



How to secure the end-caps

Ambient and Cold Application

The end-cap should be fitted tightly to the pipe. For outside applications, a sealing compound should also be used, or other methods for ensuring that water will not penetrate the system. This is applicable for both vertical and horizontal installations.

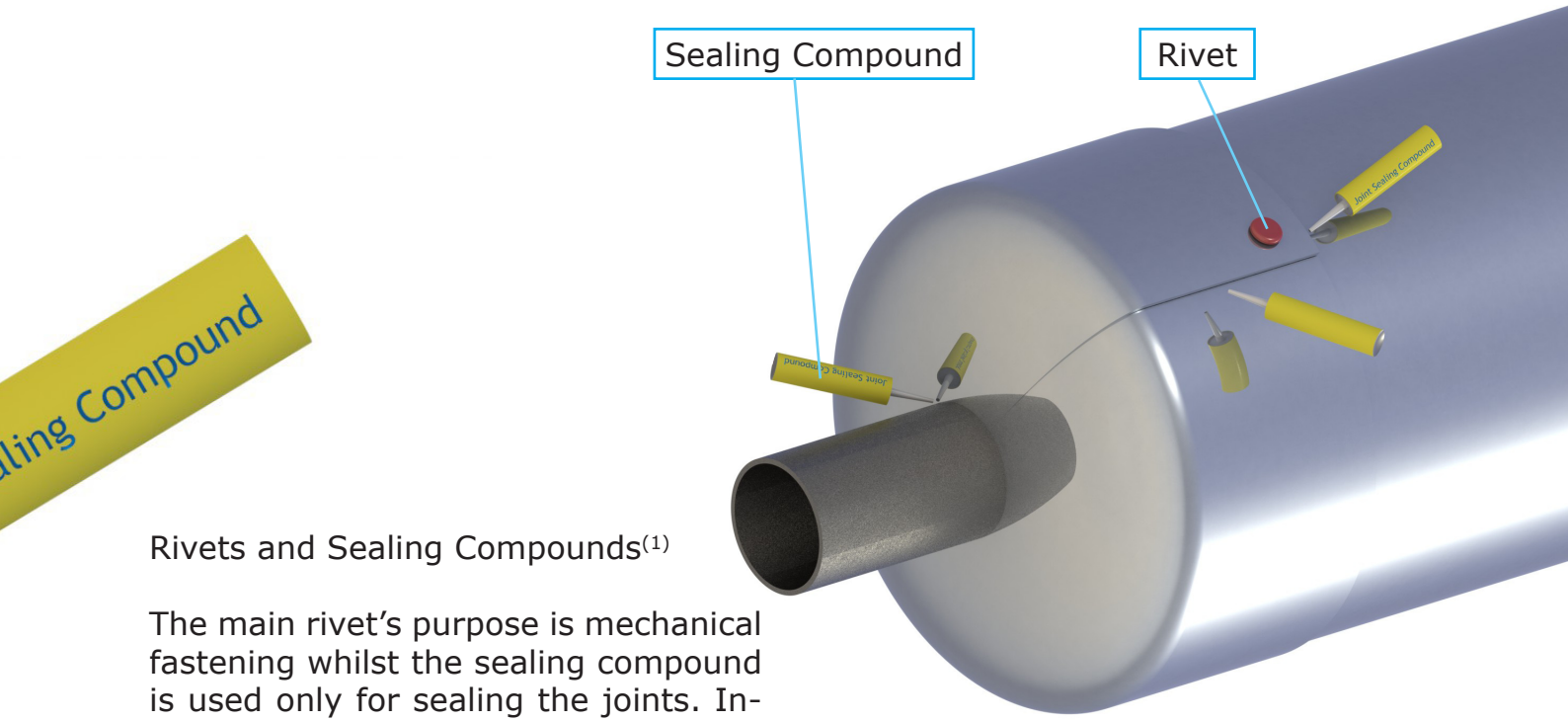
Hot Application

When the pipe is hot, a larger hole must be cut so the end-cap will not touch the pipe. The void space should be filled with a heat-resistant sealant compound.

For a more robust installation, please follow the industrial installation recommendation page (when available).

How to secure the end-caps

When securing an end-cap in place, the following elements should be considered: mechanical fastening, removal of water penetration and a final pleasant appearance. Hence, if the joint sealing compound is suitable for this application (consult the manufacturer for approval) then, in conjunction with a rivet (or more for larger end-caps) this may suffice. Bellow we will provide the installation using a special tape designed for outdoor applications (see the tape page).



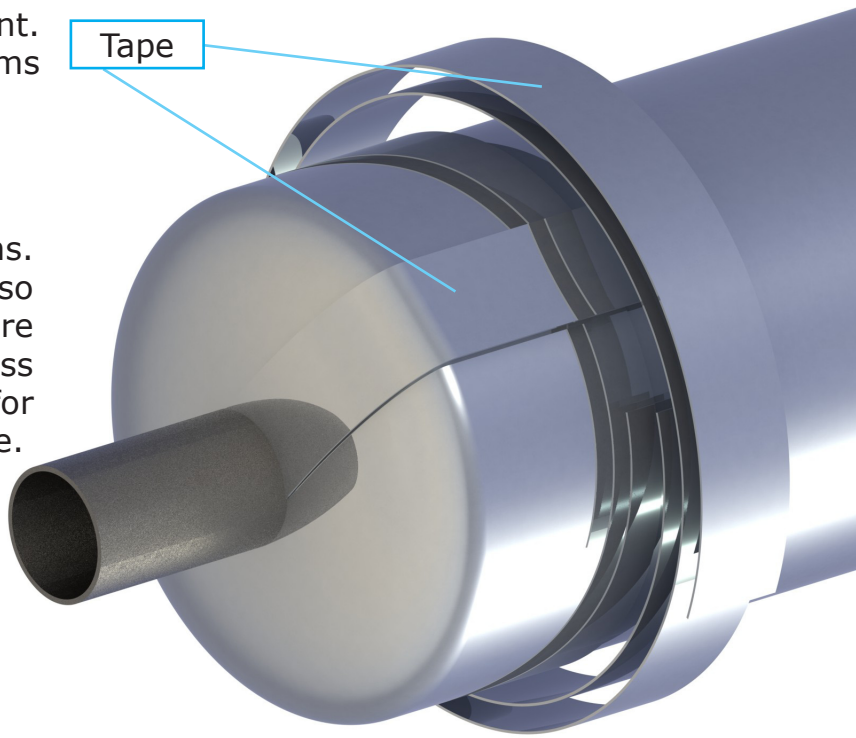
Rivets and Sealing Compounds(1)

The main rivet's purpose is mechanical fastening whilst the sealing compound is used only for sealing the joints. Indoor applications do not require sealing, unless there is a wet environment. For exterior applications, all seams must be sealed.

Tape(2) Application

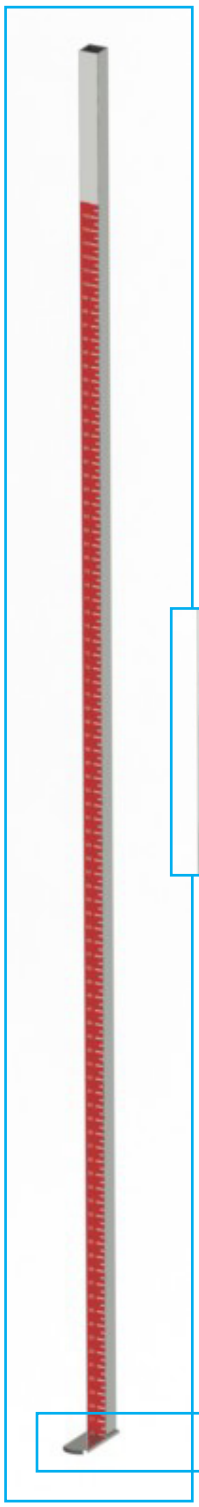
Tape should be applied on all seams. If rivets are used, they should be also covered by the tape. If no rivets are used, then ensure the tape will pass around the end-cap at least twice, for a more robust mechanical resistance.

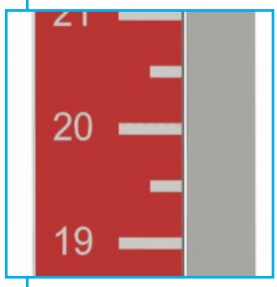
Note: the circumferential tape shown in the picture is opened, for a better representation only. It must be tightly applied to the pipe.



(1) For exterior applications, all products must be UV resistant.
(2) Standard aluminium tape is not good for this purpose. See our special tape for this purpose.

Cutting

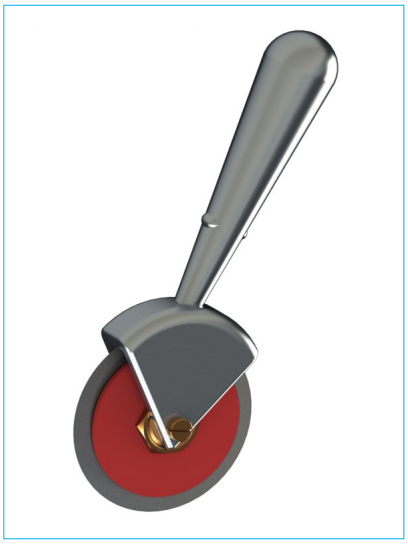




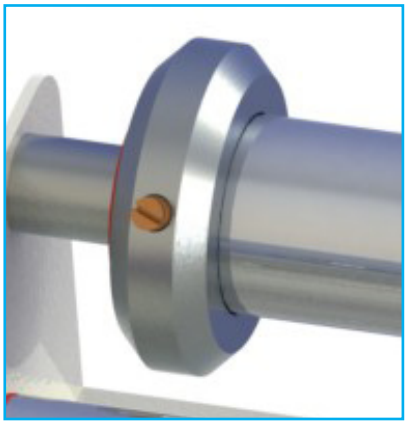
Measuring Guide

End Plate

TABLE



Cutting Wheel



Roll Side-Guides

Adjustable Feet

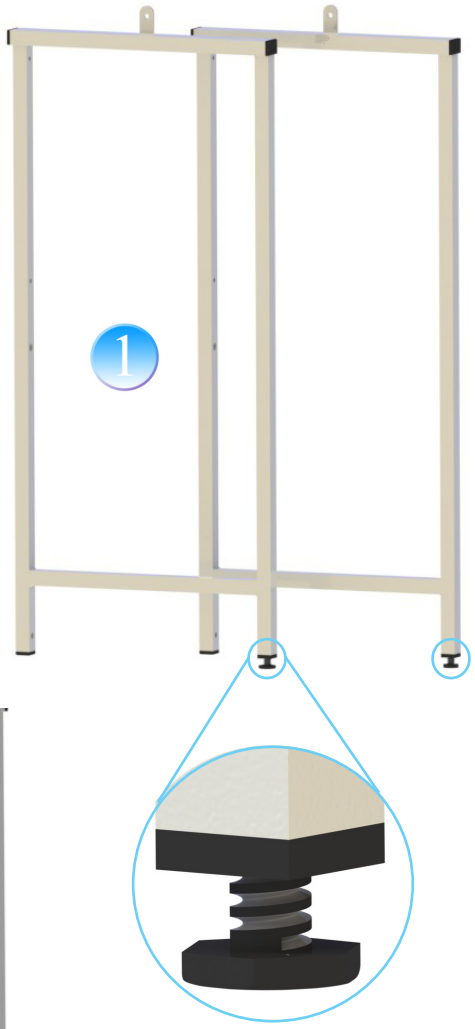
How to install the cutting table

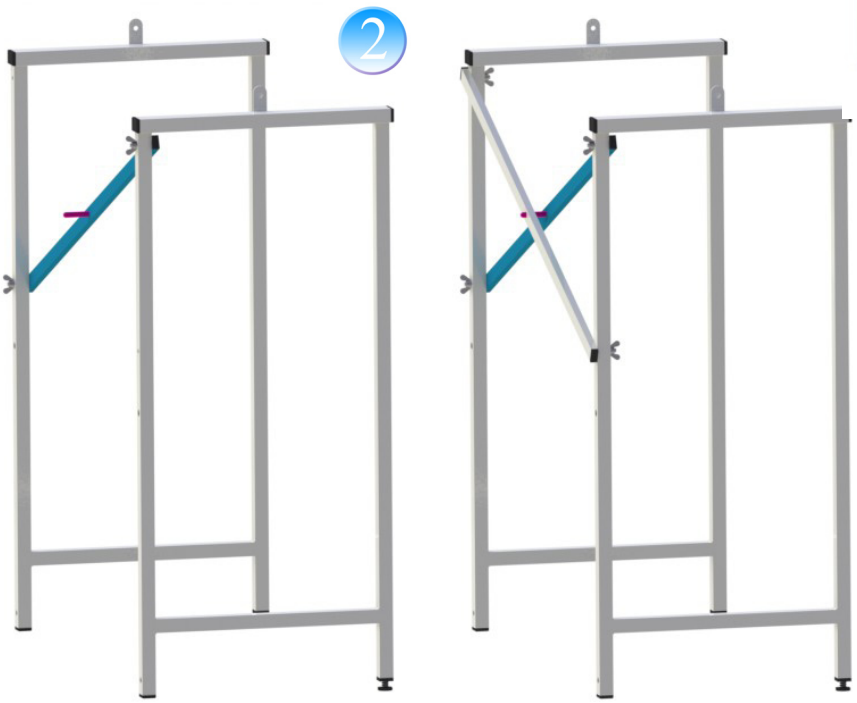
Installing the table:

1. Position the two legs with the height adjustable feet in front;

2. Install the two holding bars, alternating the height of the screw-holes and facing each other;

3. Place the table on top, facing the height adjustable legs and slide it through the provided holding wings; secure it.





Attention: there are 4 holes at the back of the legs. Use only the first 2, from the top-down. The bottom two are used to secure the holding bars during delivery.

Step 1:

Adjust the side wheel-guides to the width of the roll you are about to use. These guides will prevent the roll from sliding side-ways. You will need a small hand screwdriver that has a flat tip for this.

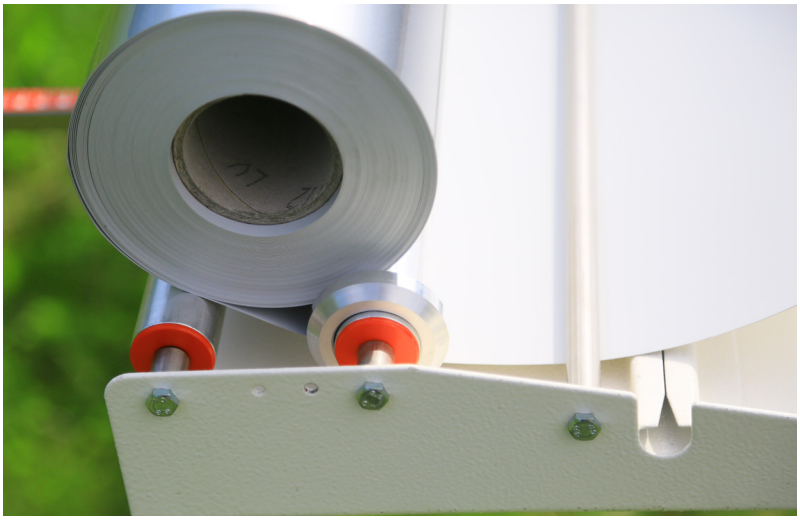
Step 2:

Ensure the table is stable and all feet touch the ground. The front two feet are height adjustable allowing to level out uneven surfaces.

Place the roll on the table.

Step 3:

When placing the roll on the table, ensure the cladding will pass through the two rolling bars, from behind-to-front, and under the single fixed rod, which suppresses the jacket from uplifting.



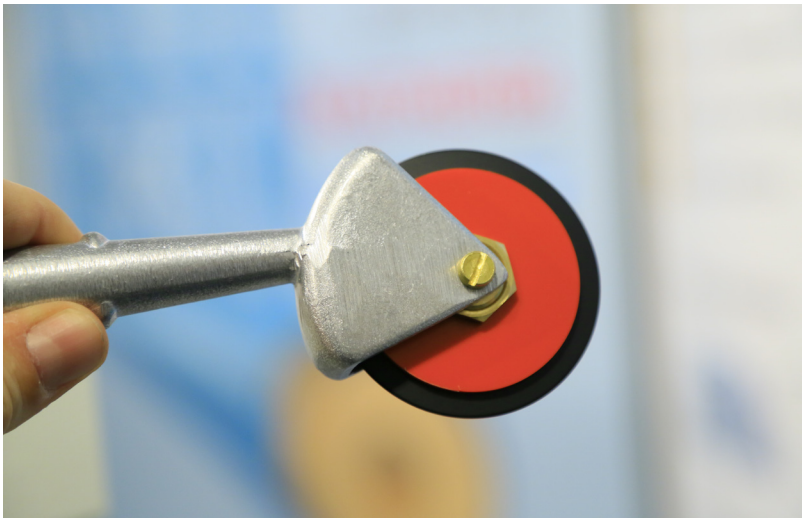
How to cut the jacket/cladding

Step 4:

Adjust the measuring tool to the desired length. Its measure corresponds to the length from the table's cutting slot to the end-plate of the metal ruler.

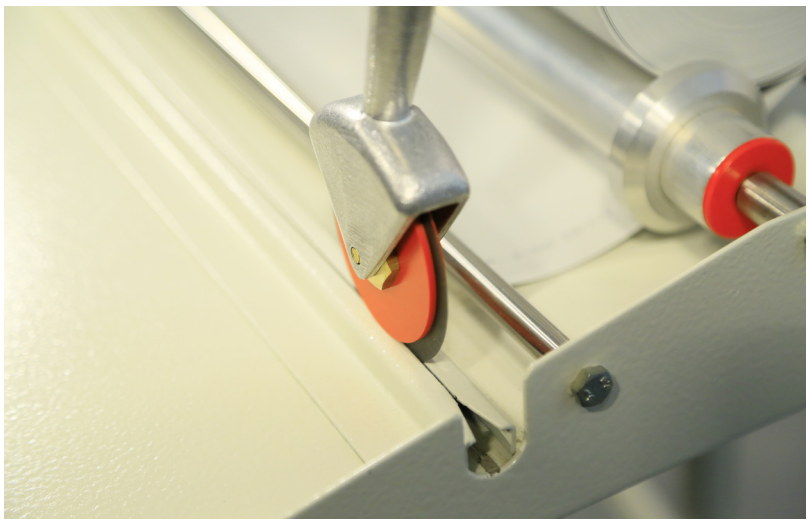
Use the wheel cutter to slit the foil. The red side-discs prevent the cutting disc from touching the metal surface, keeping it afloat.

Cutting discs are removable and can be sharpened or replaced.

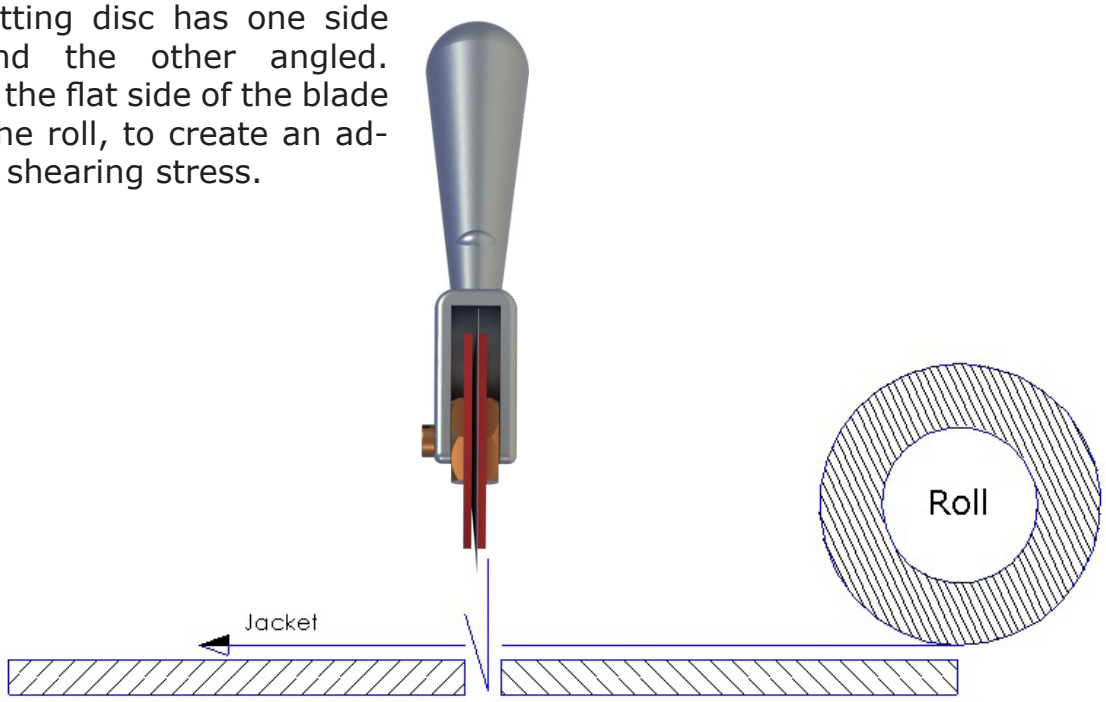


The blade will enter the longitudinal space whilst the red side discs prevents it from cutting into the metal.

Tip: A sliding knife can also be used, however, continuous care must be exercised to ensure its depth is set so it will not touch the metal part bellow.



The cutting disc has one side flat and the other angled. Ensure the flat side of the blade faces the roll, to create an adequate shearing stress.



Step 5:

Once ready to cut, pull the foil to the end-plate of the ruler.

Step 6:

If the jacket section, that you need to cut, is large enough, roll it back to allow you to get closer to the table. Then, place your hand firmly on the foil, to hold it down, and cut.

Tip: if the jacket slides away, cut it in steps; hold & cut as you move along the width of the foil.

Don'ts

- Do not cut the jacket on the ground. If you don't have a cutting table, place the roll in an up-right position, on a clean surface, measure the length and attempt to achieve a straight cut;

- Do not step on the jacket;

- Do not store the foil on the ground or rough surfaces as it may unnecessary damage its surface;

- Store the jackets in an up-right position or lay them down on a clean, smooth surface, prior to installation;

- Handle the jacket in a tubular form, for both curled or flat features. This prohibits the appearance of kinks and dents prior to its installation.

Jacketing/Cladding

As it was mentioned in the beginning, the word 'jacketing' is used in this document, instead of cladding, for simplification purposes.

There are two types of applications, horizontal and vertical. It may be, however, more suitable to just distinguish them by indoor and outdoor installations, and their corresponding methods of full, partial or no sealing of the seams.

Before we discuss the installation, the method of measuring a circumference must also be understood. The circumference refers to the distance around a circle; if we were to cut the circle at one point and then lay it flat - it is this length. This measure becomes useful when schematics provide the OD or NB of the pipes. Following the bellow formula, we can determine the circumferential length of the required jacket.

Circumference = π (Pi) * Pipe OD = 3.1416[1] * OD

The numerical value of Pi is lengthy: 3.14159265....[2]however, most people will only use 3.14 or 3.1416 to calculate the circumference, depending on the precision required. It is believed, for the insulation industry, that Pi = 3.1416 will suffice.

Indoor Installation

1. Wrap a flexible measuring tape around the insulation to obtain the circumference and add the overlapping length to it. How much overlapping is needed? Please look at the bellow table.

Insulated Pipe OD	≤ 120mm	> 120 ≤ 255mm	> 255mm
Circumference	≤ 376mm	> 376 ≤ 800mm	> 800mm
Overlapping	30mm	40mm	50mm

Additional overlapping may be required if expansion and contraction is to be taken in calculation.

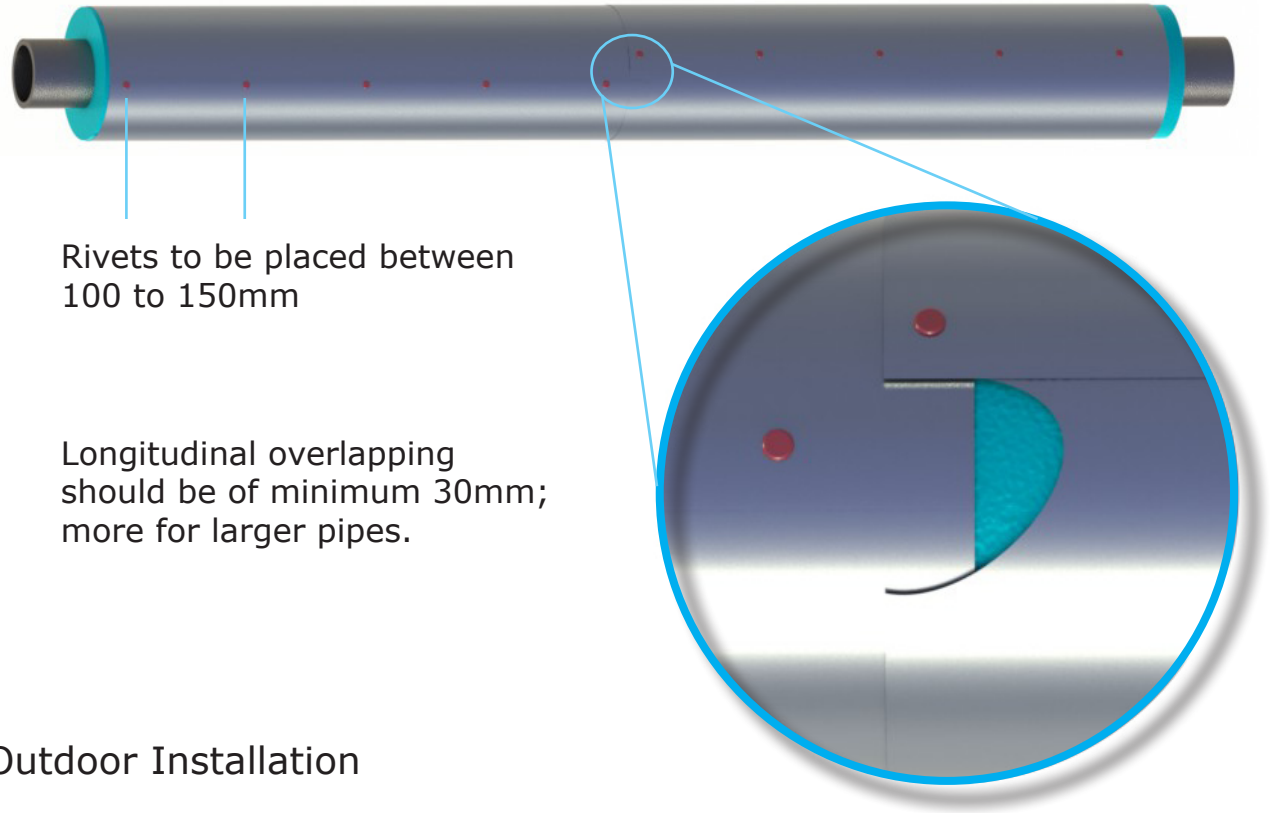
Example

If the insulated pipe OD = 100mm; then
Its circumference = 3.1416 * 100 = 314.16mm
Add the overlapping of 40mm: 314.16 + 40 = 354.16mm or just 355mm

Therefore, the jacket's circumferential size is: 355mm. This is the size of the jacket you should cut.

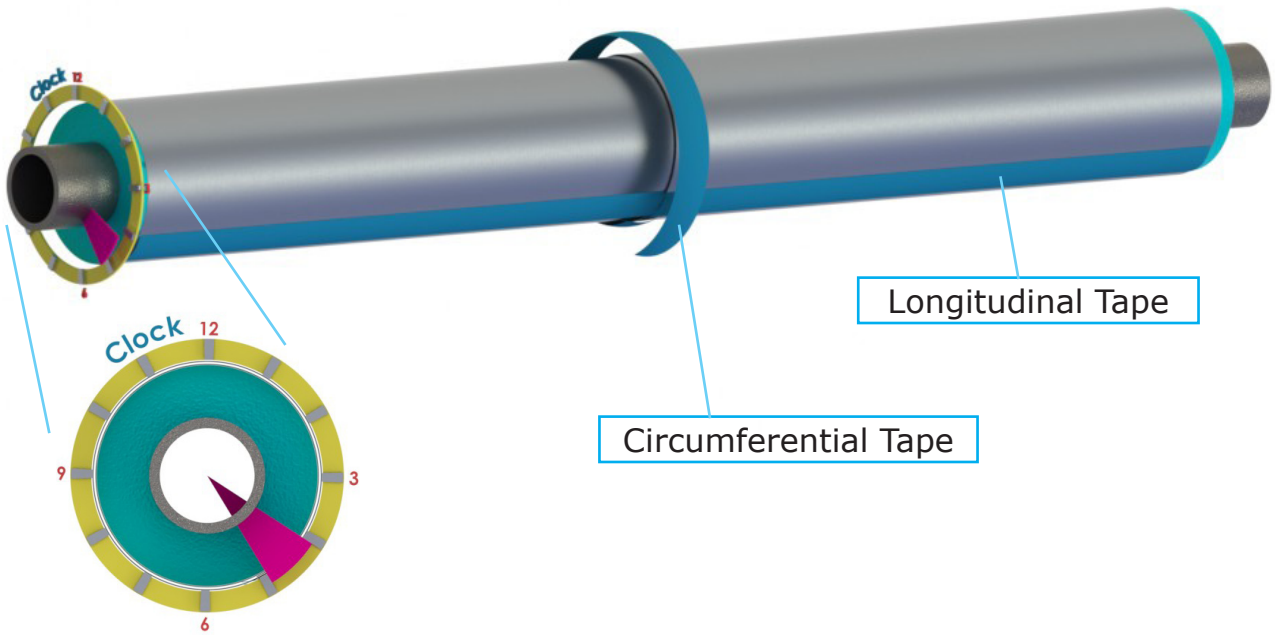
(1) Be aware: the decimal point is written both with a '.' (dot) or ',' (comma), depending on the country.
(2) Reference: www.wikipedia.org/wiki/Pi

2. Apply and rivet the jackets in place, ensuring the seams are positioned away from the walkways, for a better esthetical appearance.



Outdoor Installation

Exterior applications require all seams to be sealed. This is also applicable to the indoor installations where liquid penetration is a concern. Therefore, tape must be applied on top of the rivets, both longitudinally and circumferentially.

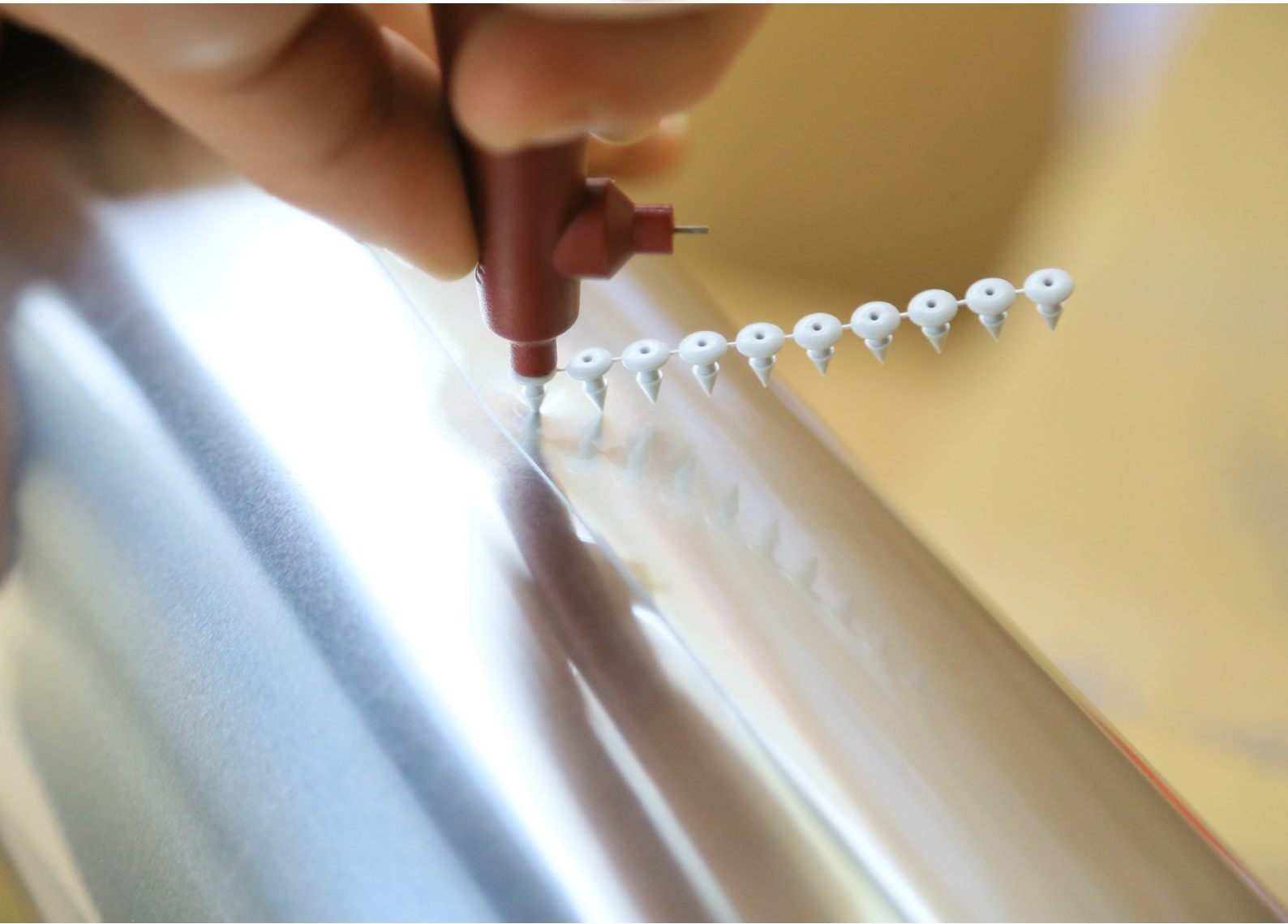


Longitudinal seams must be placed at 4-5 o'clock.

Rivet Tool & Rivets

Rivets are used to mechanically secure the jackets in place. Although special metal rivets may also be used, we will be describing here only the standard polymer ones, which complement the nonmetallic jacketing system.

Rivet Tool and Rivets



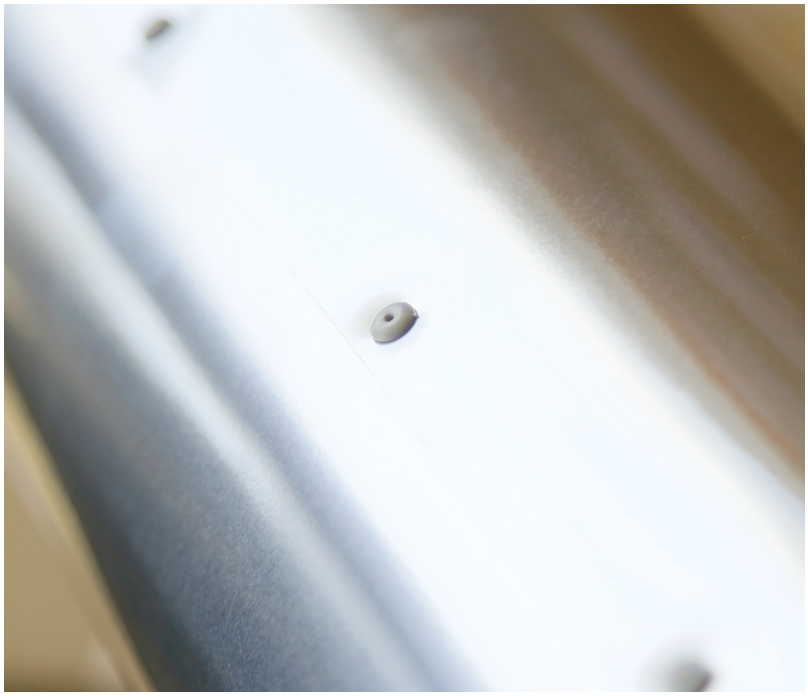
How to apply the rivets

There are two methods of inserting the rivets, depending on the installer's experience.

A. Punch a hole into the foil with the rivet tool, then plug the rivet into the metal tip of the tool and push it into the hole.

B. Place the rivet tool, with the metal tip, into the rivet and push the rivet directly through the foil.

Tip:
If you have never used these type of rivets, use some scrap material to accustom yourself with these installation methods.



Rivets should be placed between 100 to 150mm apart. However, when cladding takes place over short lengths, for example 200mm, ensure the ends of the jacket are well secured; and place another rivet in the middle.

Don'ts

Do not punch the rivet too close to the edge of the jacket as it may break. Allow a minimum of 10mm distance. Pay also attention to the cold temperatures; it's best to firstly test on some scrap material and then on the finished jacket.

Tapes

Tapes are used to seal the system to avoid any water penetration, especially for outdoor applications. Unlike the standard aluminium tapes that break easily, these tapes have been designed to withstand mechanical abuse, such as vibrations and contraction/expansion of equipment.

There are two types of tapes we recommend:

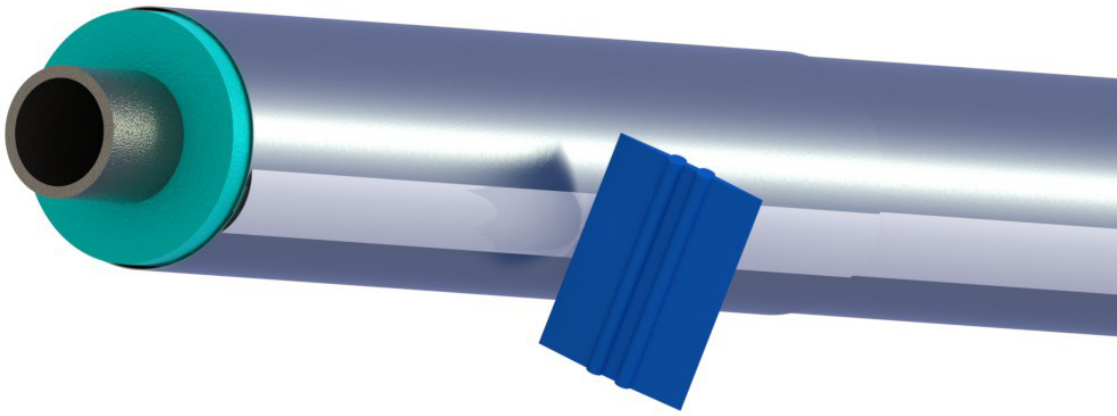
Commercial Tape

It is a self-adhesive tape combining aluminium foil with a polymer top layer to provide a mechanically strong and corrosion resistant product.

Industrial Tape

Also a self-adhesive tape, it is made of four layers; a combination of two aluminium and two polymer layers. This arrangement provides a robust tape that could sustain extra mechanical abuse, whilst also being corrosion resistant. Normally, this tape cannot be ripped by hands requiring a pair of scissors or snips to cut it to the desired length.

These tapes are pressure sensitive. That means that a spatula must be used to firmly press the tape down, otherwise its glue will not activate.



Tip:
The commercial tape is thinner therefore it may create less wrinkles when applied over uneven surfaces, or when sealing two jackets. Therefore it is recommended for a better look. The industrial tape is recommended where extra mechanical strength is desired.

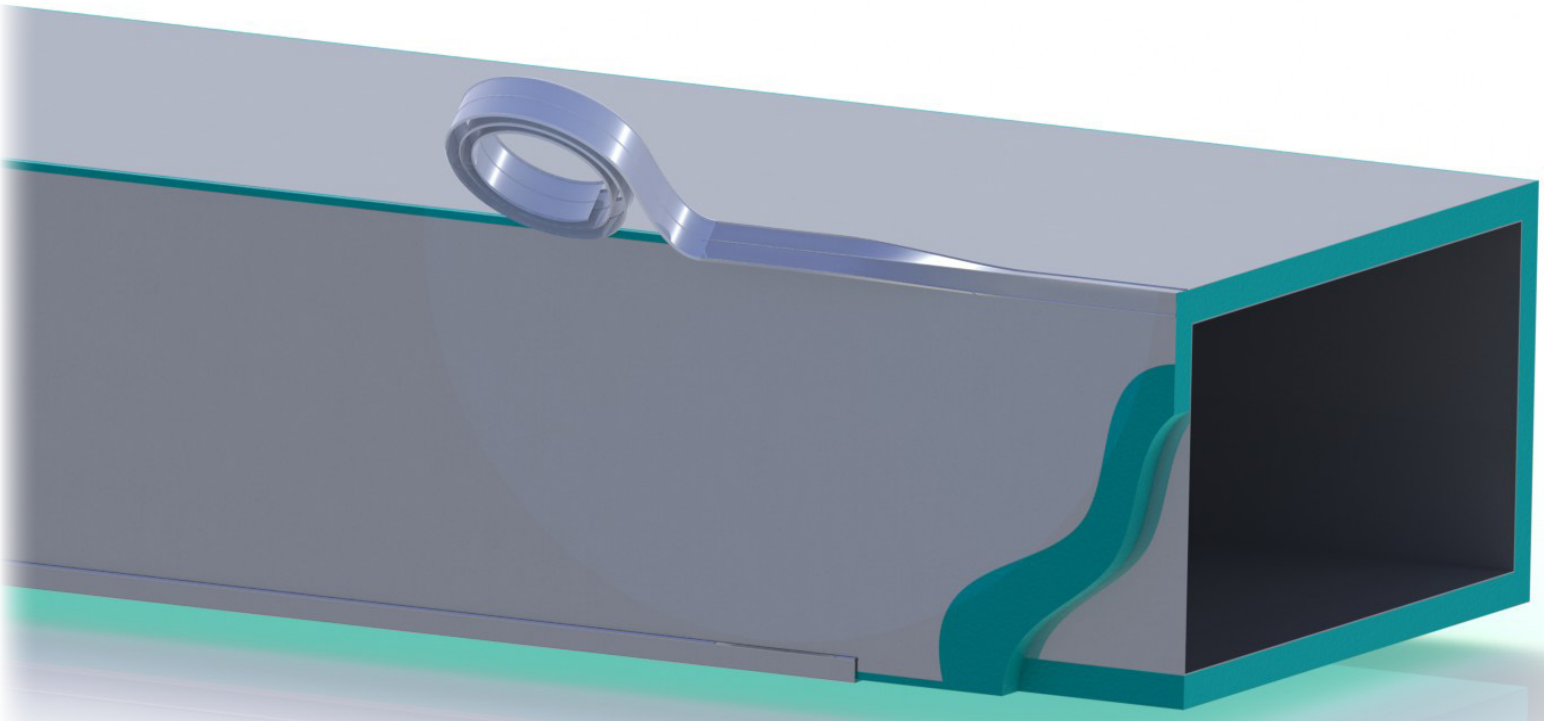
EASYTAPE

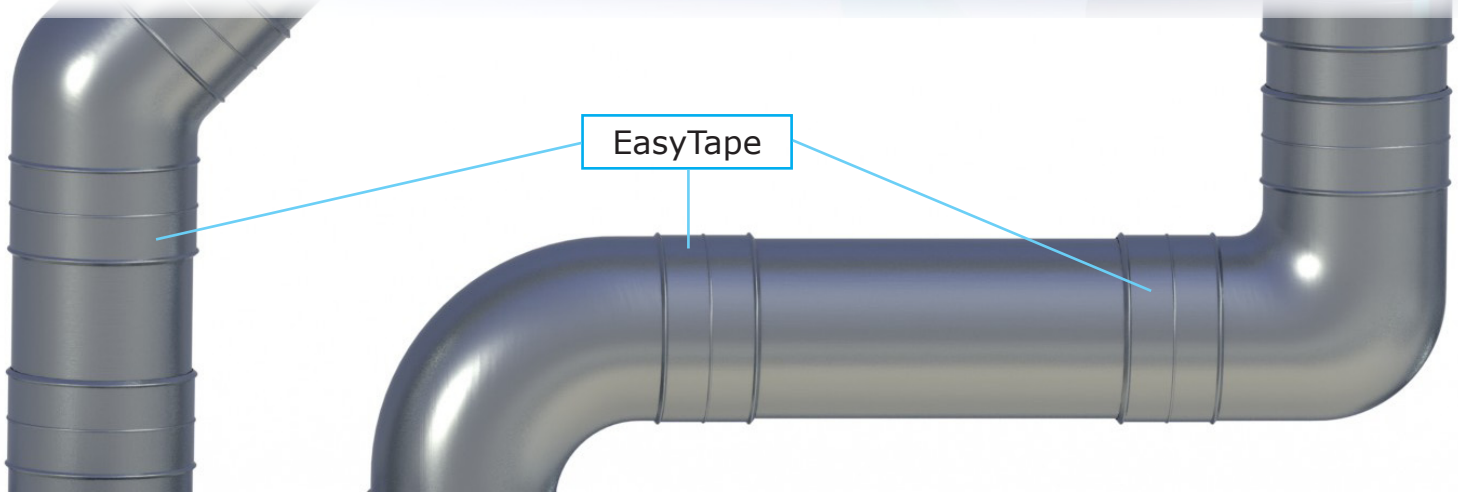
The EasyTape has a more esthetical than a mechanical purpose. It complements the standard tape by creating a very neat installation. Also, as the name suggests, it is very easy to apply: wrap it around the pipe and secure it with rivets.

EasyTape is strong, about 0.4mm thick, made out of 5 layers of polymers and aluminium-foils. Due to its rigidity, it can also be folded in two and applied on duct edges.

EasyTape

Note: For water proof purposes, EasyTape should be used in conjunction with the normal tape or butyl.

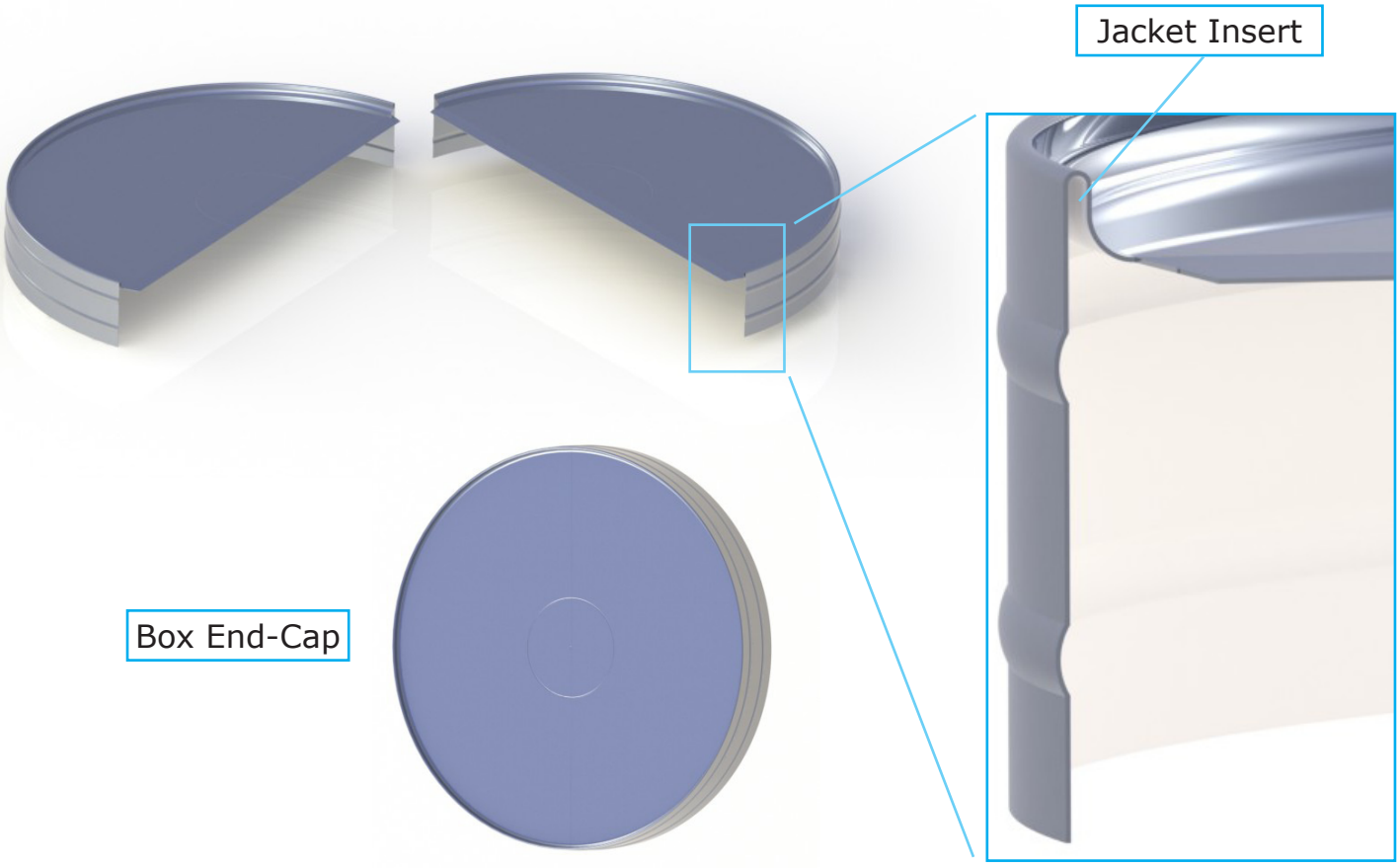




Valve Boxes

There are many types of valves and insulation-installation combinations. We will focus on a basic shape valve, to give the general idea what it needs to be accomplished.

The availability of prefabricated parts, for larger valves, is reduced. Hence, one solution is to provide special end-caps, that will be installed at the ends of the valve (see bellow), the jacket itself forming the body of the box. These end-caps are made in two halves exhibiting a slotted gap where the jacket will be inserted.

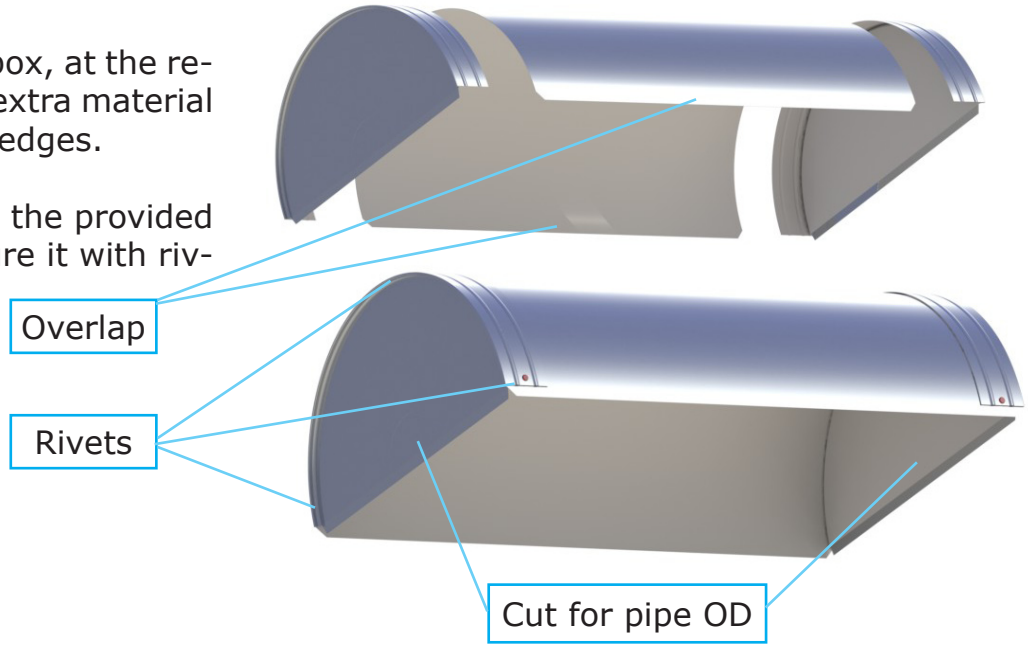


Installation

1. Cut the body for the box, at the required length, allowing extra material for overlapping at both edges.

2. Insert the jacket into the provided end-caps slots and secure it with rivets and/or tape.

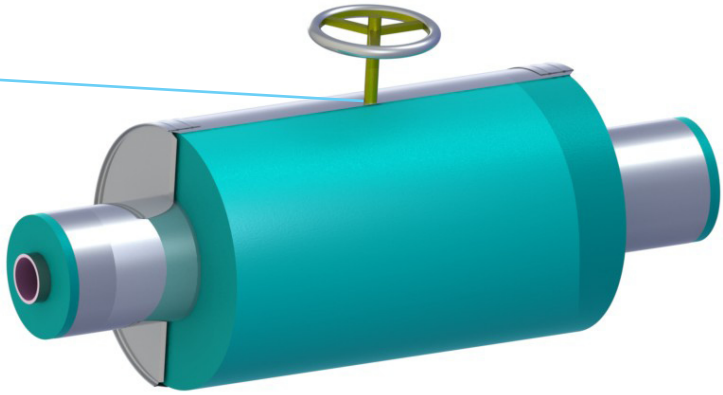
3. Cut holes at both ends for the required insulated-pipe OD.

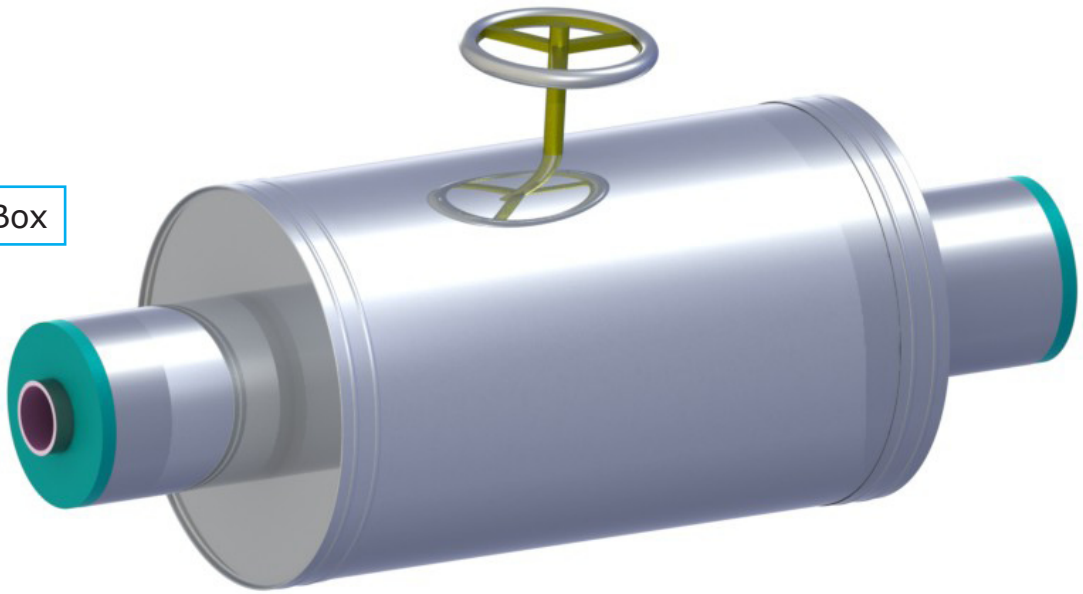


4. Cut a slot for the handle.

5. Decide whether you need a removable or a fixed box. For removable use toggles/latches or use only tape, which can be later cut and replaced.

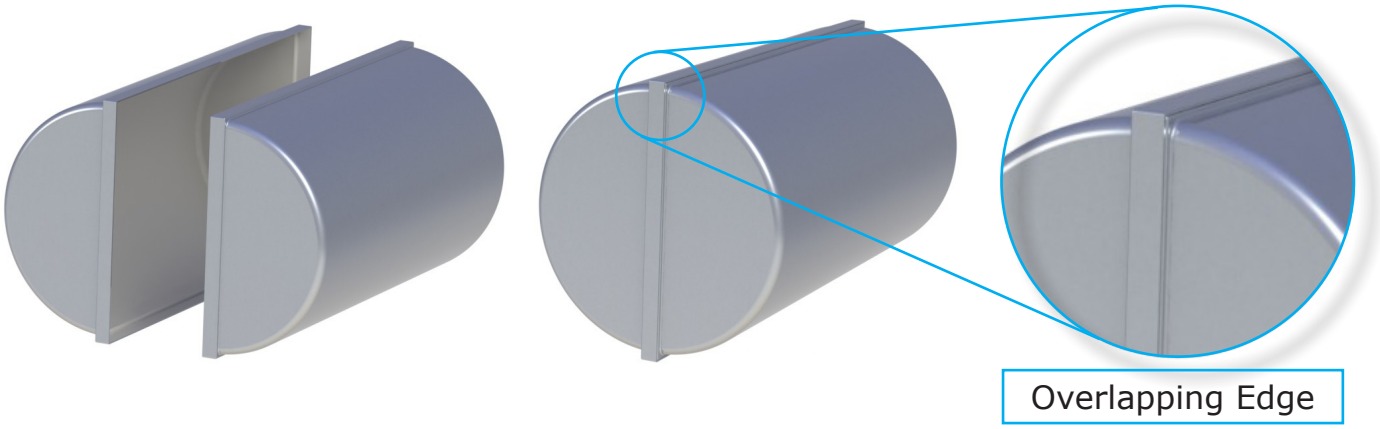
6. Install the box. For exterior applications all seams must be sealed with tape or UV resistant sealant.





EasyBox

These multi-fit boxes are suitable for covering smaller valves, flanges and other items that protrude from the normal pipe OD.



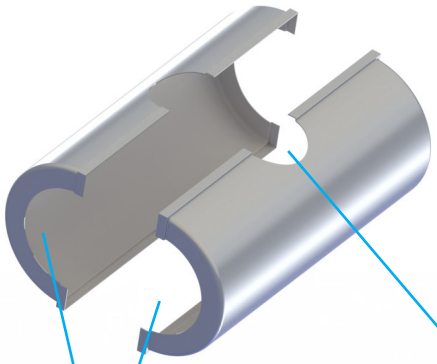
Installation

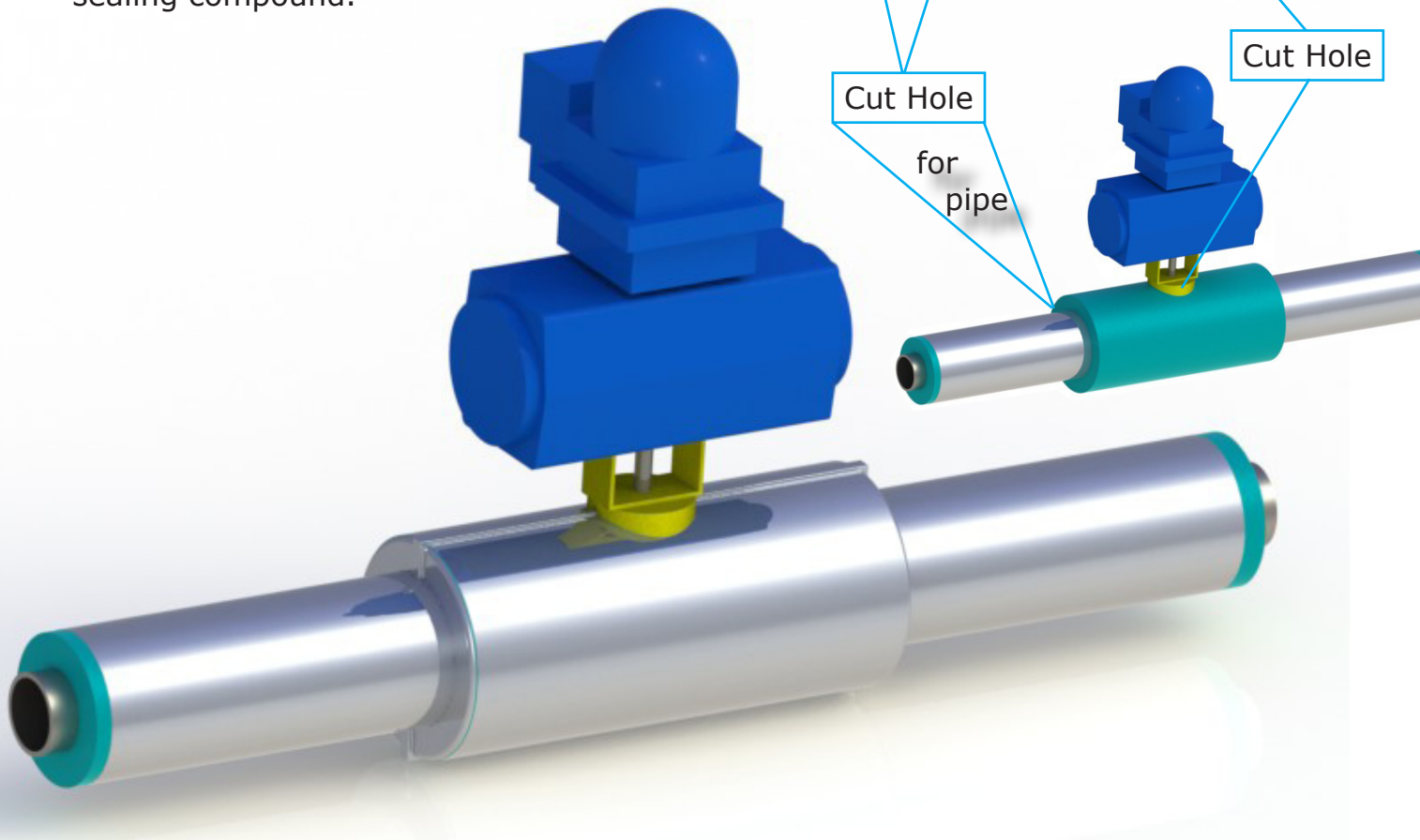
1. Cut the holes for the protrusions;

2. Mount the box;

3. Use rivets and/or tape to secure it;

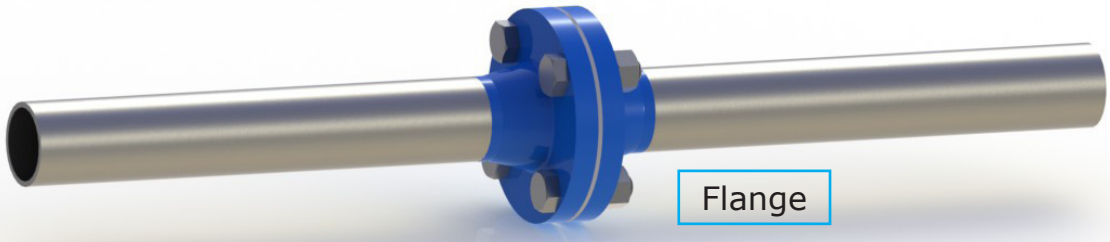
4. If it's installed outdoor, seal all the joints with tape and/or other adequate sealing compound.





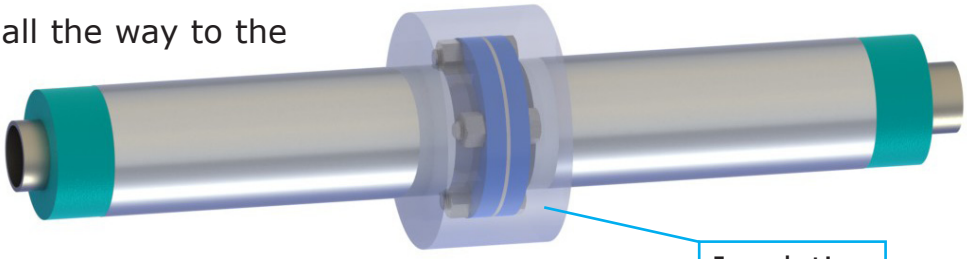
Flanges

Flanges can be covered with either valve-boxes, two-part boxes or using the standard foil to cover the body and two end-caps for the ends of the box. This alternative may be preferable when the box length is unknown, which also depends on the method of insulation application. The maintenance engineer should be consulted.

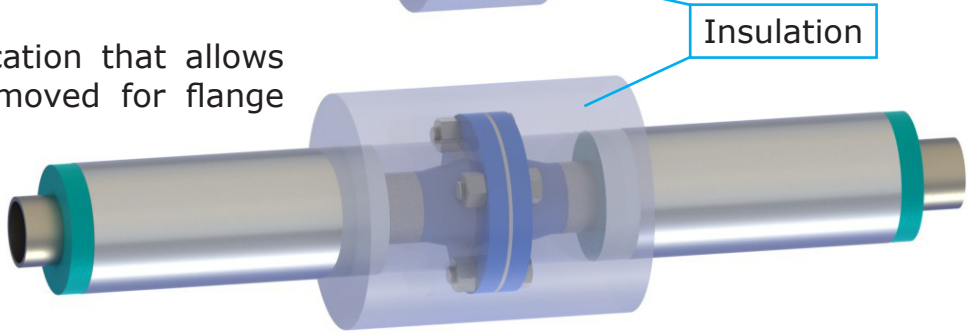


Insulation Methods(1)

A. Insulation fitted all the way to the flange.

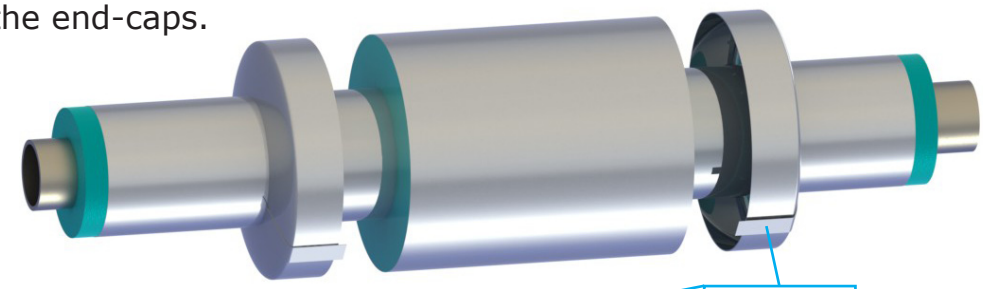


B. Insulation application that allows the bolts to be removed for flange maintenance.

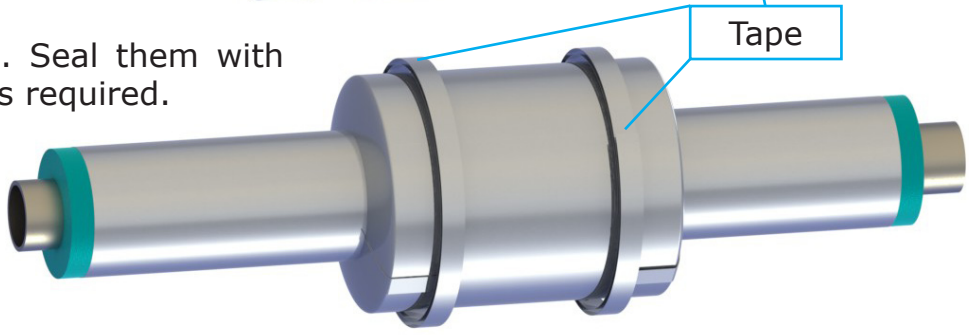


Installation

1. Fit the jacket over the insulation-body and prepare the end-caps.



2. Fit the end-caps. Seal them with tape if water proof is required.



Note: follow the installation practices for the jackets and end-caps from their related pages.
(1): consult with the maintenance manager and/or insulation manufacturers for advice.

Basic Tools

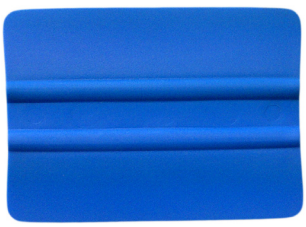
1. Cutting Table

2. Cutting Tools - straight and curve shears

3. Measuring Tape
(folding or flexible)

4. Rivet Tool

5. Spatula



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