K-FLEX USA
INNOVATION IN INSULATION

PLUMBING HVAC/R COMMERCIAL/INDUSTRIAL MARINE OIL&GAS ACOUSTIC

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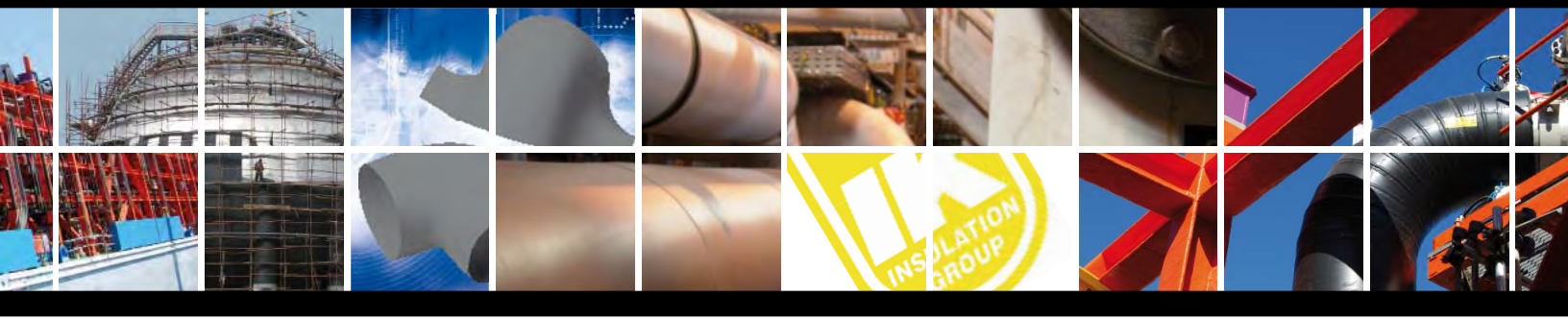


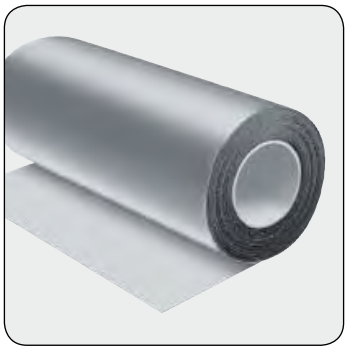
INSTALLATION MANUAL

K-FLEX Clad® IN Jacketing

K-FLEX CLAD® IN JACKETING PATENT PENDING

K-FLEX CLAD IN Jacketing is a patent pending, flexible, non-metallic, polymeric-based (CPE) protective jacketing for all insulation types (elastomeric, mineral fiber, polyurethane, cellular glass, etc). It is an excellent moisture vapor barrier, providing protection against corrosion under insulation (CUI), for harsh applications experiencing wide temperature cycles and constant exposure to high humidity and/or weather conditions. This includes protecting insulation on piping, tanks and vessels in Oil & Gas, cryogenic, operating mill (paper and pulp), and industrial plant applications, among others.

The application procedure for adhering Clad® IN Jacketing to other insulation types (listed above) is the same as that for elastomeric. K-FLEX USA does not take any responsibility concerning the installation of non-K-FLEX insulation materials.



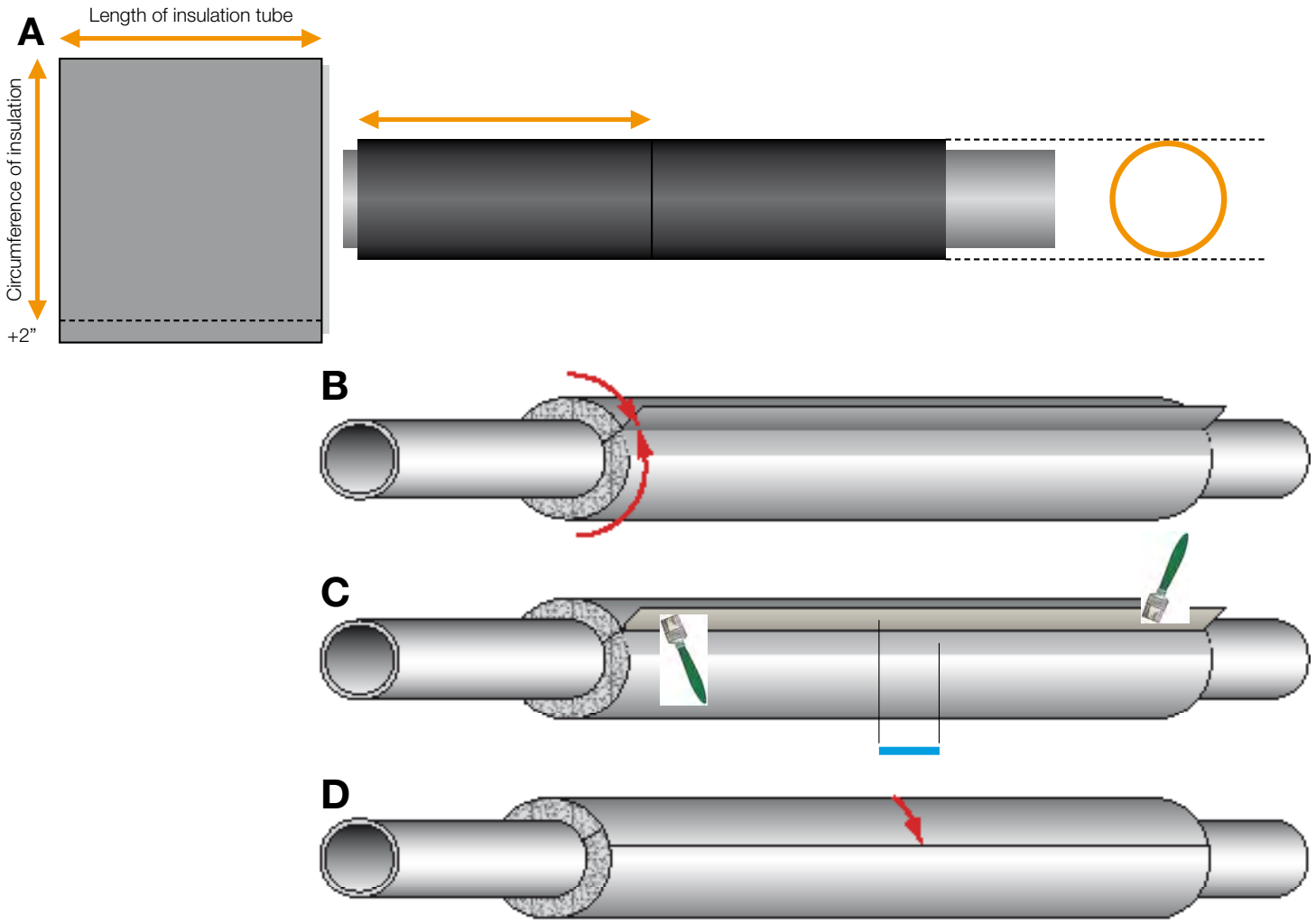
Availability:
39” wide x 75’ long rolls
.045” thick
Black or Gray

K-FLEX CLAD IN Jacketing can be sealed (seams) either by an approved solvent-based contact adhesive or by heat welding. Detailed procedures for each method are highlighted in this manual. *Note: Heat welding method is not recommended for all insulation types, including flexible elastomeric foam. Contact K-FLEX technical support before using heat welding method.

*Heat Gun Welding**
Volts: 120; Temp. Range: 140°F to 1004°F; Air Flow: 14.8 cfm
Heat Gun manufactured by Leister or similar should be used

Solvent-Based Contact Adhesive
K-FLEX® 420 Contact Adhesive
Polychloroprene base

PIPES WITH CONTACT ADHESIVE



A)
Cut a section of CLAD IN sheet corresponding to the circumference of the insulation tube, leaving 2” extra for the longitudinal overlap, and corresponding to the length of the insulation tube.

B)
Install the sheet on the tube placing the longitudinal joint against the flow of water (the overlap and the part which will be overlapped).

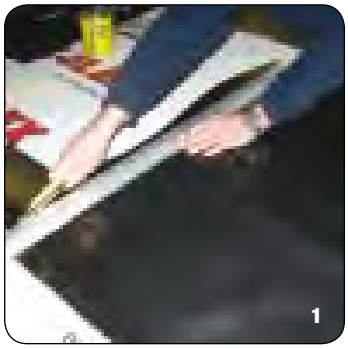
C)
Adhere the parts with contact adhesive.

D)
Close the longitudinal joint carefully pressing together the glued edges in order to obtain an even result, without creating stretch marks.

Where specified or requested, procede with sealing joints with an approved marine-grade sealant.

KEY 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE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1. PREPARATION OF CLAD IN JACKET
From a roll of K-FLEX CLAD IN, cut a sheet with the same width as the circumference of the insulated tube, adding approximately 2" extra for the longitudinal overlap.

2. INSTALLATION
> Apply a layer of K-FLEX 420 adhesive along the section of the tube to be covered with K-FLEX CLAD IN.
> Position the K-FLEX CLAD IN on the area where the glue has been applied and from that point wrap the K-FLEX CLAD IN sheet around the whole section.
> Securely press down the K-FLEX CLAD IN jacketing along the whole circumference to obtain a tightly fitted jacket (figs. 3-5).

> With a brush, apply K-FLEX 420 adhesive on both ends in order to obtain a perfect seal against water between the covering and the insulation material (fig. 6).

Note: Take care to stagger the edges of the insulation and the edges of K-FLEX CLAD IN to avoid continuity with the underlying edge. Each sheet of K-FLEX CLAD IN should be positioned in such a way as to overlap the next sheet by at least 2". Use K-FLEX 420 adhesive on both the longitudinal and transverse overlaps.


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3. SEALING WITH MARINE-GRADE SEALANT*
In order to obtain a covering with a secure water barrier, use a marine-grade sealant approved by K-FLEX USA on all joints:

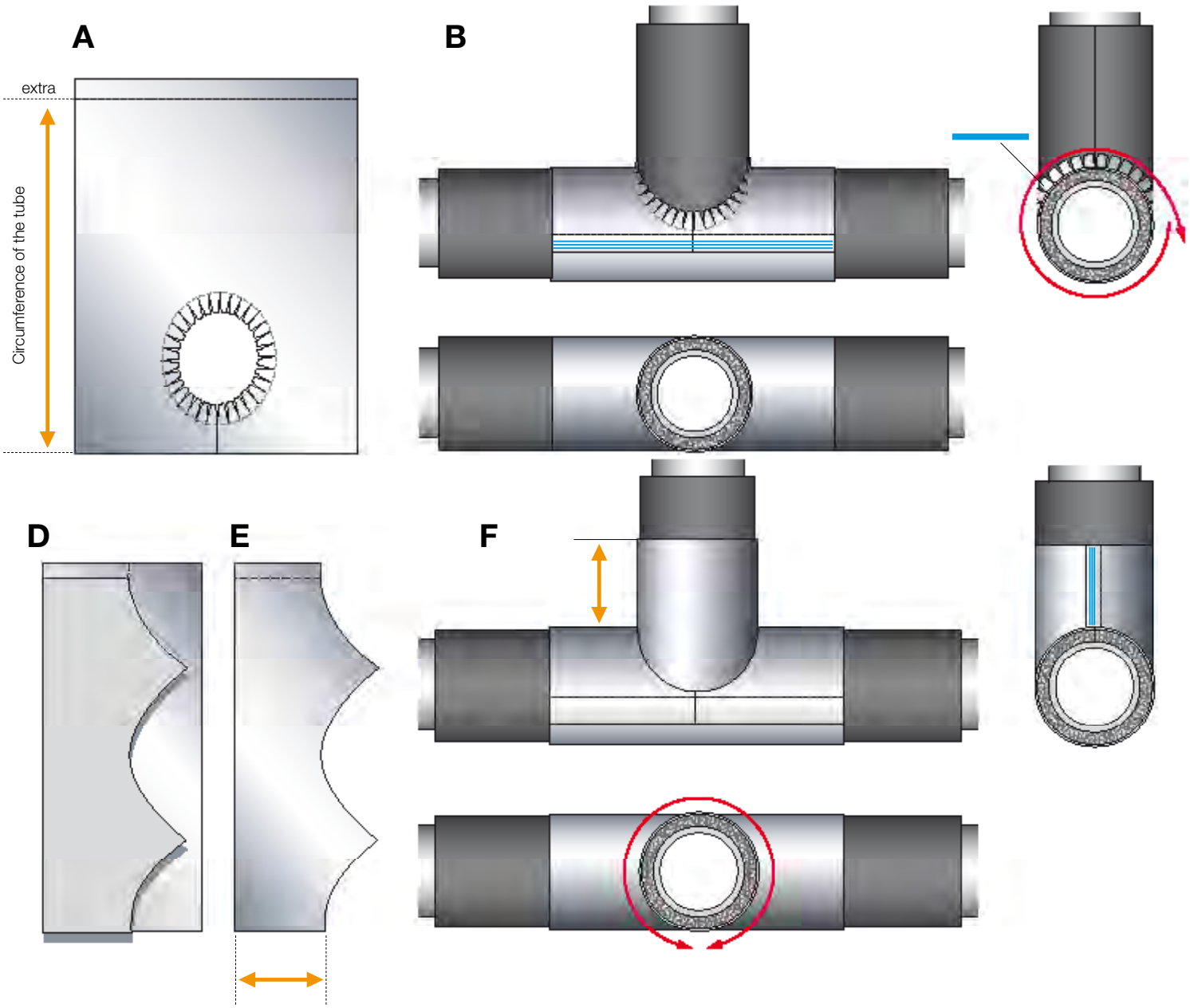
- Between all the longitudinal and transverse overlaps of the K-FLEX CLAD IN covering.
- Between the pipe supports and the K-FLEX CLAD IN covering.
- Between the overlaps of the valves, flanges, "T" connections and terminals.
- On the sections of the elbow covered with K-FLEX CLAD IN.
- On all the overlaps and K-FLEX CLAD IN joints.

Proceed as follows on all joints (fig. 7 and 8):

> With the correct dispensor, spread a layer of marine-grade sealant at least 1/2" wide.
> Check that there are no breaks in the seal.
> Carefully follow the instructions indicated on the tin of sealant and check the time required to obtain a secure and permanent seal.

* Where specified or requested.

PIPES WITH CONTACT ADHESIVE: INTERSECTIONS



A) From a K-FLEX CLAD IN sheet, cut a section out with the same dimensions as that of the surface of the insulated tube, leaving extra for the overlap.

B) Place the shape around the connecting pipe.The indentation should open up around the “T-piece”. Glue the overlap and seal the logitudinal edges of the sheet.

C) With the same adhesive, also glue the indentations onto the connecting tube.

D) Using the appropriate template, draw the shape of the connection on a section of K-FLEX CLAD IN sheet leaving 2” extra for the overlap.

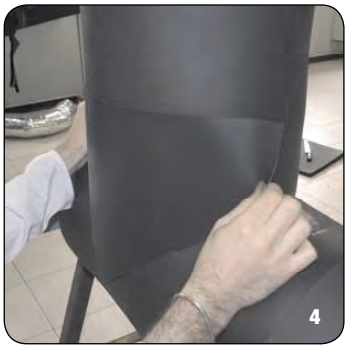
E) Cut out the shape.

F) Place the shape around the section of the connecting pipe. Glue the overlap and seal the longitudinal edges of the sheet.

Where specified or requested, procede with sealing joints with an approved marine-grade sealant.

KEY 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE: INTERSECTIONS

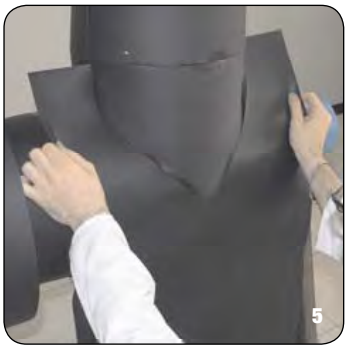


1. FIXING THE K-FLEX CLAD IN JACKETING ONTO THE "T" CONNECTION

> Thoroughly degrease each section of the K-FLEX IN CLAD "T" connection with appropriate thinners.

> The "T" connections are made in two pieces that should be directly applied onto the elastomeric sections. First, install the main section of the "T" connection followed by the coupling sections.

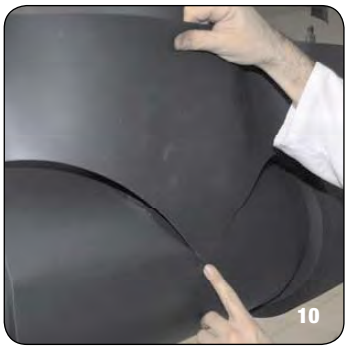
> Apply K-FLEX 420 adhesive, as shown in figures 1-3, both to the elastomeric material and the K-FLEX CLAD IN jacketing.



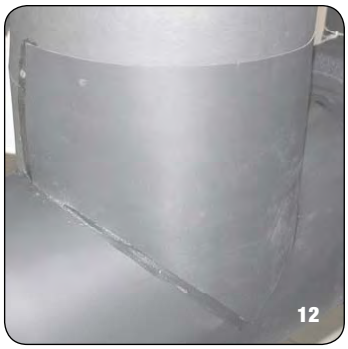
> Once the K-FLEX CLAD IN jacketing is positioned onto the insulation, carefully seal all the overlaps with K-FLEX 420 adhesive (fig. 6).

> Finally, press the overlaps down to make sure that both surfaces firmly adhere together (fig. 8).

PIPES WITH CONTACT ADHESIVE: INTERSECTIONS



> Proceed to apply the K-FLEX CLAD IN jacketing onto the coupling, repeating the same procedure as before (figs. 9 and 10).



> Finally, spread 420 adhesive over all the joints (fig. 11).
> The “T” connection is now ready to be sealed with an approved marine-grade sealant (fig. 12).

2. APPLYING MARINE-GRADE SEALANT*:
> Apply a 1/2” layer of marine-grade sealant on both sides of all joints.
> Proceed carefully as indicated in figures 13 and 14.

> Marine-grade sealant should be applied to all joints as seen in figure 16.

* Where specified or requested.

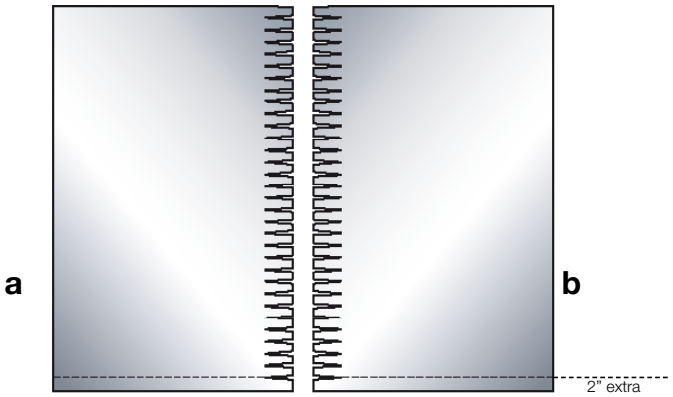
PIPES WITH CONTACT ADHESIVE: FLANGES

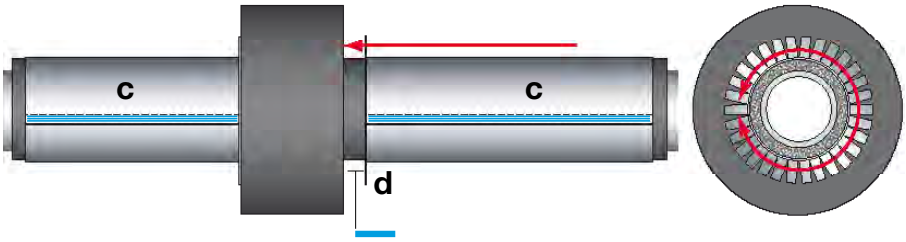
Jacketing adjacent tubes

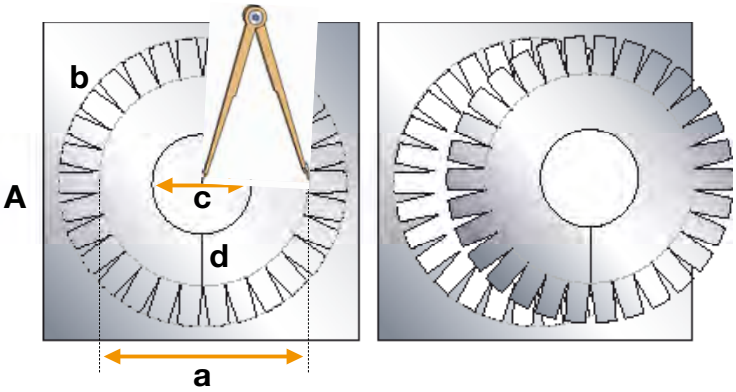
> Prepare two CLAD IN sheet sections **(a-b** the surface of the adjacent insulated tubes, and cut out the indentation on the side that flange.

> Wrap the two sections around the insulat against the flange disks in order to obtain p

> With the correct adhesive, glue the longitu indentation, which is in contact with the flar water.







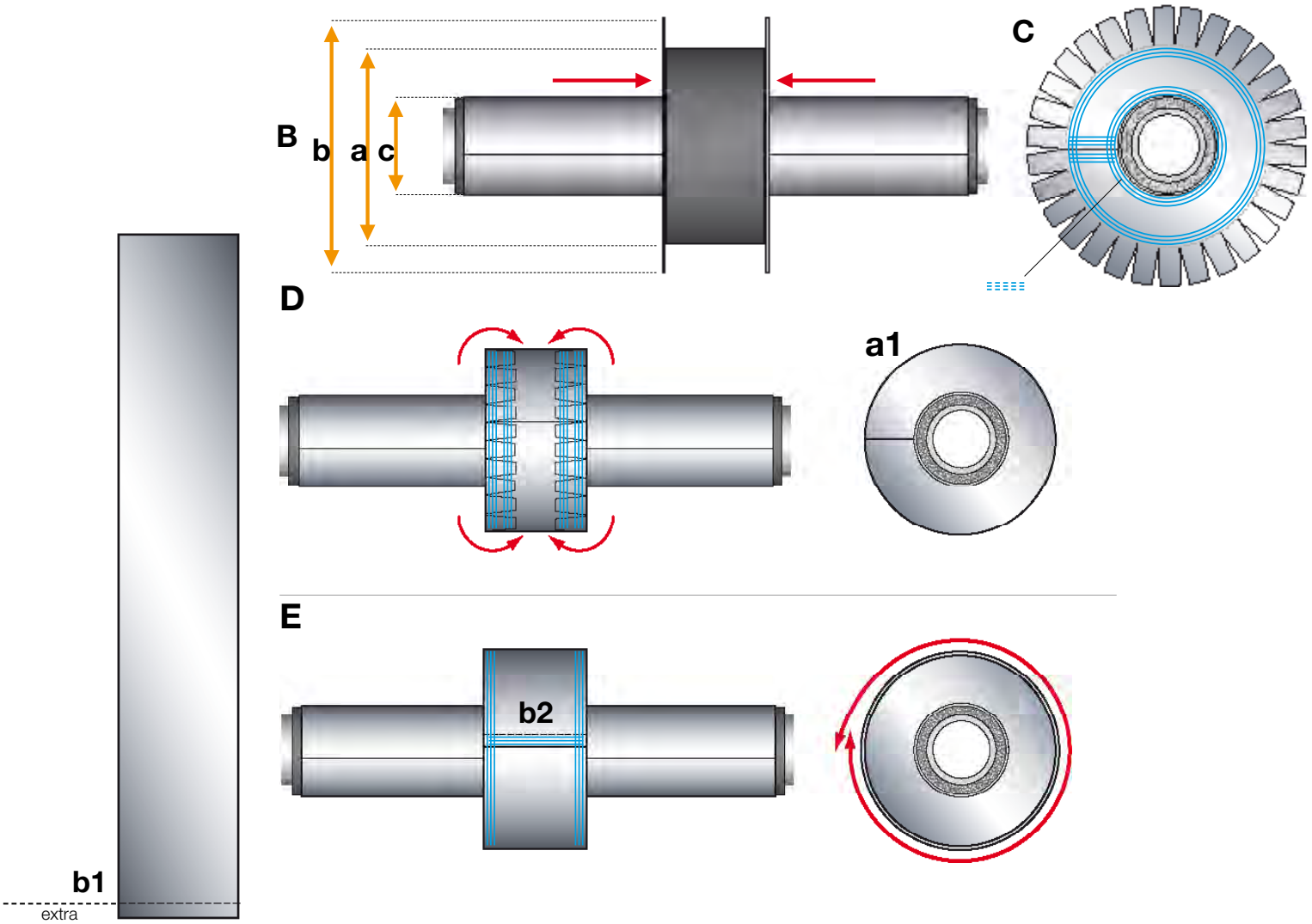
Jacketing lateral disks

A) Prepare two equal sections of CLAD IN sheet and on each one trace an indentated ring of a diameter corresponding to the disks of the flange **(a)**.
The diameter **(b)** defines the limit of the external profile of the indentations.

The diameter of the hole **(c)** corresponds to that of the pipe already covered on which the indentated ring should be installed. The tracing should include a cut **(d)** for easy installation of the rings on the respective tube.

KEY 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE: FLANGES



B) After cutting out the shape of each ring, place it on the respective pipe so that it adheres to the disk of the flange and covers the indentation of the sheet previously installed on the tube.

C) On parts which come into contact with the flange, seal the disk with the correct glue along the circumferences and where cuts have been made.

D) Glue the indentations with the correct adhesive, bend them along the circumference and seal them on the body of the flange.

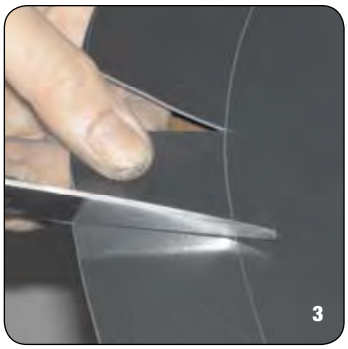
E) Cut a section of K-FLEX CLAD IN sheet of a dimension calculated to cover the external part of the valve's body, covering the identations. The covering sheet should have an excess to serve as the overlap (**b1**).

Apply the sheet section around the valve's body with the overlapping edge turned against the flow of water. Glue the joints with the correct adhesive (**b2**).

Where specified or requested, procede with sealing all joints with an approved marine-grade sealant.

KEY 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE: FLANGES



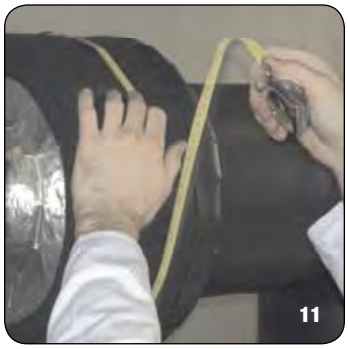
1. APPLYING K-FLEX CLAD IN JACKETING ONTO FLANGES

> Measure the internal and external diameters of the flange (fig. 1).
> Using a compass, mark out the internal and external measurements onto a sheet of K-FLEX CLAD IN. Add an extrea 2” to the external diameter and trace a third circle (fig. 2).
> Using a sharp knife, cut around the furthest circle to obtain the disc.

> Make external and internal fringes on the disk as indicated in figure 5.
> The disk is now ready to be mounted onto the flange (fig. 6).
> Repeat the same operation to cover the other side of the flange.
> Make an opening cut on the disk and slot it onto the flange.
> Use K-FLEX 420 adhesive to fix the disk onto the flange (figs. 7 - 8).

PIPES WITH CONTACT ADHESIVE: FLANGES

> Tightly close the fringes of the disc, which have already been glued with K-FLEX 420 adhesive, in order to obtain a perfect grip.
> When installed, the disk should appear as in figure 10.



> Proceed by measuring the central section of the flange (fig. 11).
> Transfer the measurements onto a sheet of K-FLEX CLAD IN and cut out the required section (fig. 12).

> Spread K-FLEX 420 adhesive on the elastomeric material and wait until it is almost dry.

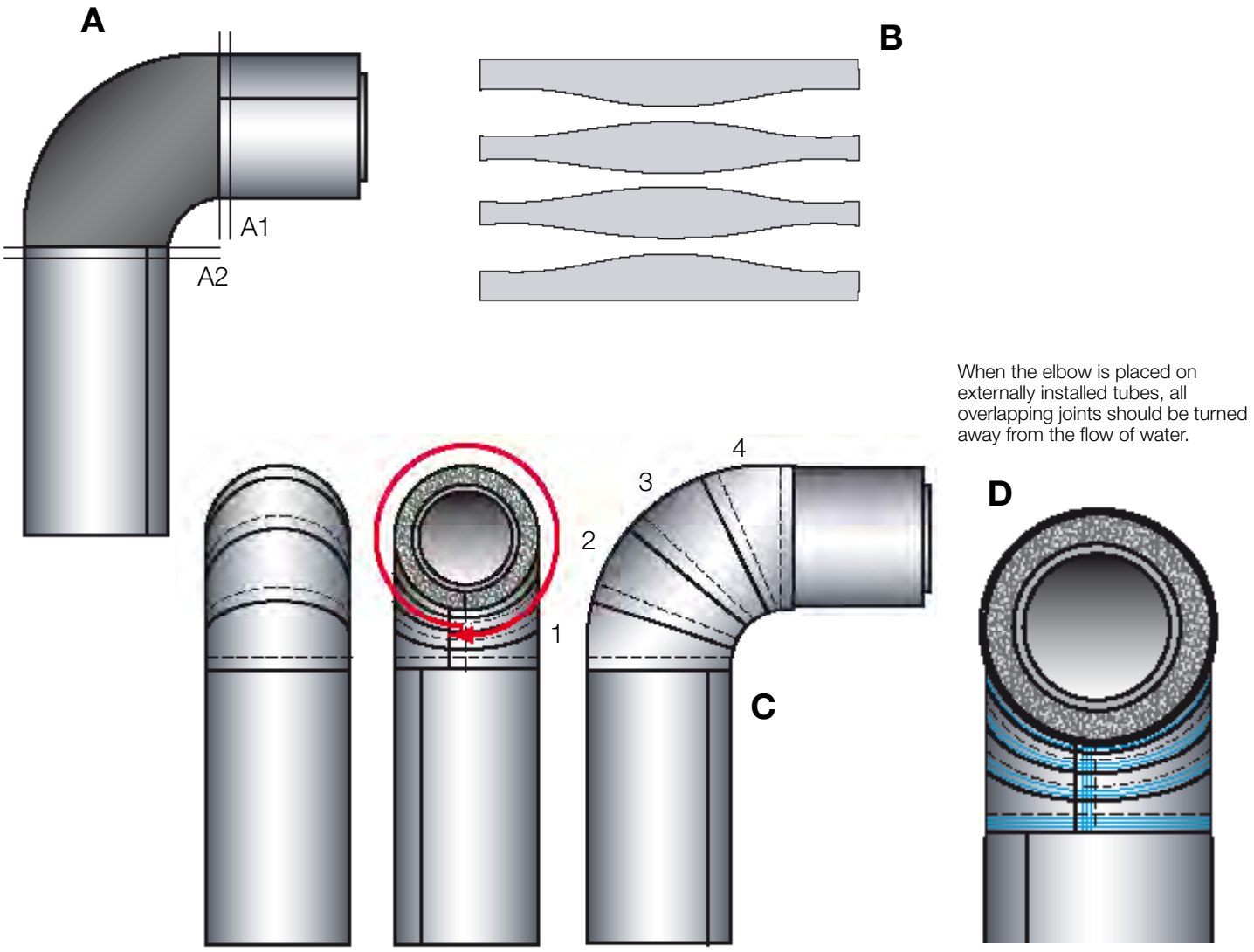
> Place the previously prepared strip of K-FLEX CLAD IN onto the flange.
> To correctly attach the K-FLEX CLAD IN sheet, use K-FLEX 420 adhesive and allow it to almost dry before sealing down both edges.

PIPES WITH CONTACT ADHESIVE: FLANGES

2. APPLYING MARINE SEALANT*:
a) Spread a 1/2” layer of an approved marine-grade sealant over both sides of all joints.
b) Proceed carefully as shown in figures 17 - 18.

* Where specified or requested.

PIPES WITH CONTACT ADHESIVE: ELBOWS



Arranging the jacketing shapes to form an elbow.
A) After having prepared an insulated elbow, factory- or field-fabricated, and having insulated the adjacent tubes, apply the jacketing to the insulated tubes leaving 2" extra (**A1-A2**) to allow for overlapping the elbow covering.

B) Using the appropriate template, draw the shape of the connection on a section of K-FLEX CLAD IN sheet leaving 2" extra for the overlap.

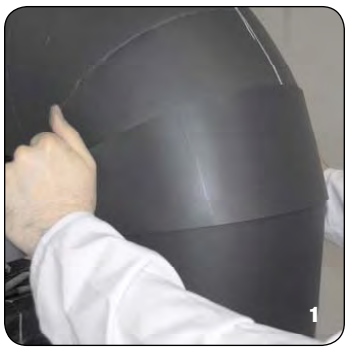
C) Apply the segments of CLAD IN sheet on the elbow. For the joints of the segments, overlap the extra segments prepared in advance against the flow of water. For this reason the mounting sequence of the segments is carried out starting from the lowest part (see numbering **1-4**, referring to a four section elbow covering).

D) Each shaped segment should be sealed around the insulated elbow, using the overlaps already prepared. **Apply 420 adhesive on the joining edges**, the overlaps of the elbow and on the head.

Where specified or requested, procede with the sealing joints with an approved marine-grade sealant.

KEY K 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE: ELBOWS

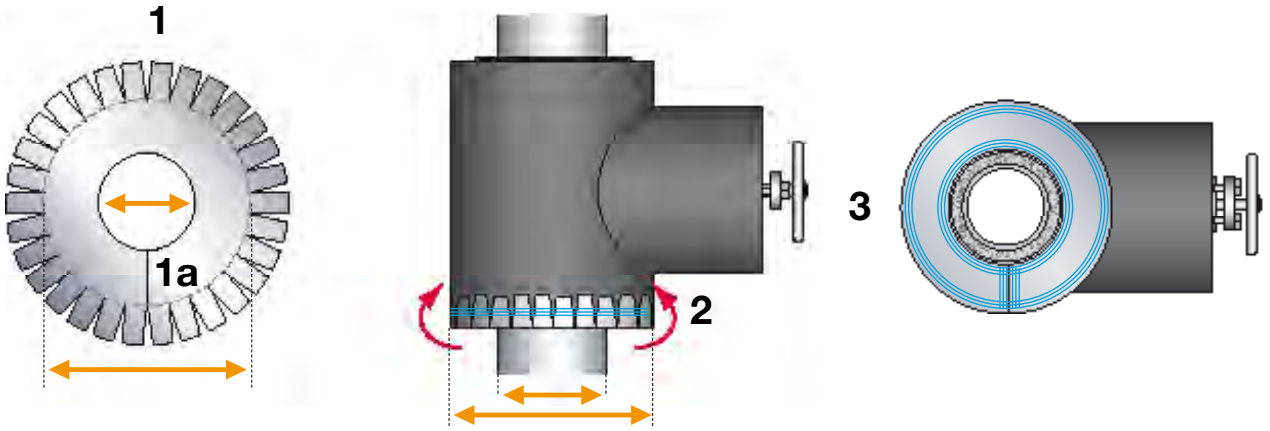


1. APPLYING K-FLEX CLAD IN JACKETING ONTO ELBOWS
> Apply the preformed K-FLEX CLAD IN elbow segments onto the elbow by sealing them onto the elastomeric material with K-FLEX 420 adhesive.
> After appling the K-FLEX 420 adhesive, wait until it is almost dry before fixing the segments onto the elbow.
> The elbow segments should be fixed onto the throat with K-FLEX 420 adhesive (figs 3 - 4).

2. APPLYING MARINE SEALANT*:
> Spread a 1/2” layer of approved marine-grade sealant over both sides of all joints.
> Proceed carefully as indicated in figures 5 - 6.

* Where specified or requested.

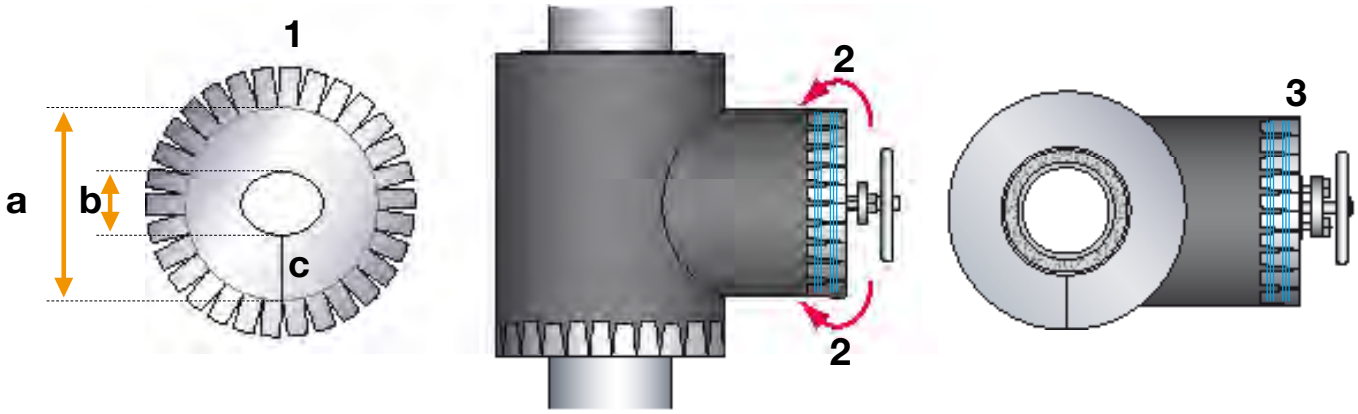
PIPES WITH CONTACT ADHESIVE: VALVES



> Cut out a ring (diameter of the cylindrical body of the valve) with the external indentation and the central hole corresponding to the diameter of the tubes already covered (**1**).

> Make an opening cut (**1a**) on the indented ring and place it on the lower edge of the valve.

> Fold the indentations on the cylindrical body of the valve and fix it with adhesive (**2-3**).

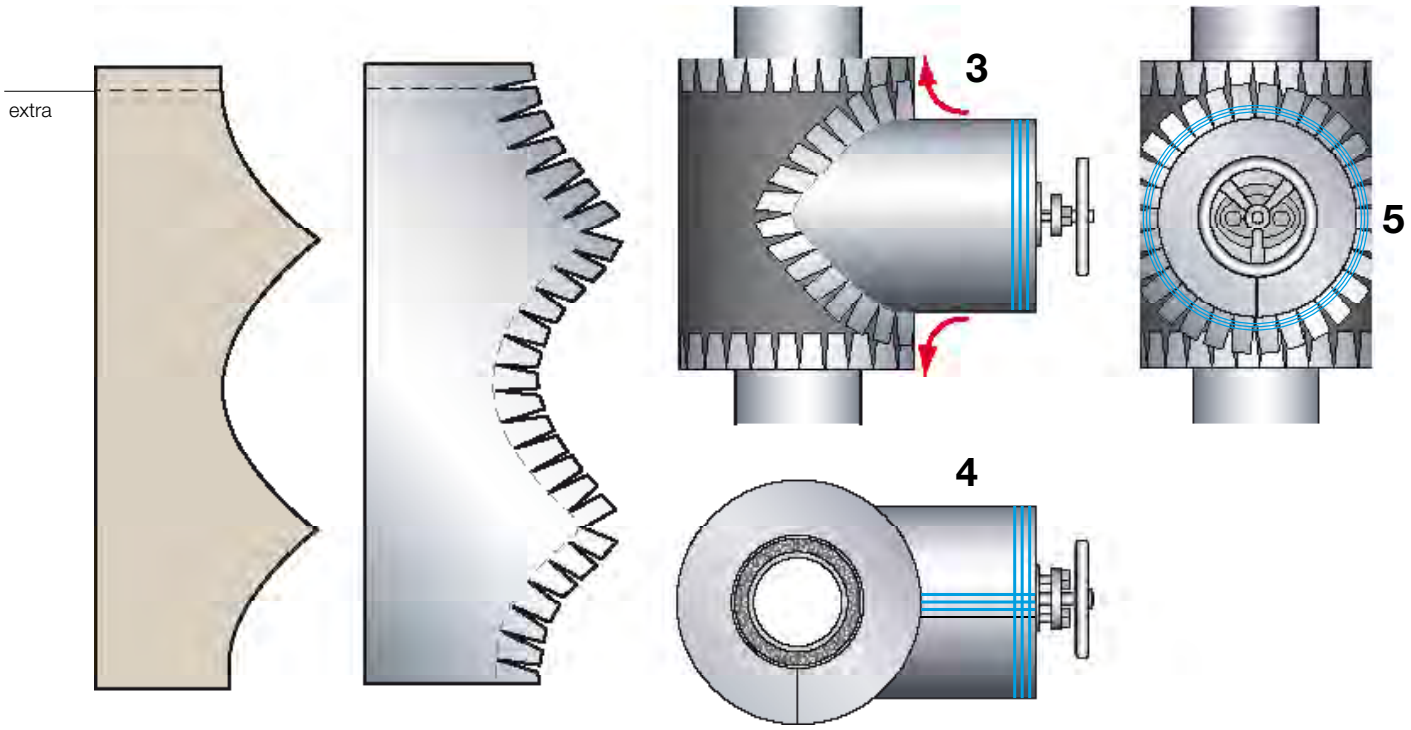


> Cut out an indented disc (**1**) for the finishing of the front part of the box, with a central hole corresponding to the support of the manual control device (**b**). On the shaped ring also make an opening cut (**c**).

> Place the ring on the front of the stuffing box and fix it with adhesive. Fold the indentations on the cylindrical body of the box and fix them with adhesive (**2-3**).

KEY 420 adhesive Measurements Actions

PIPES WITH CONTACT ADHESIVE: VALVES



> With the appropriate template cut out the finishing of the box body, leaving an excess for the overlapping of the joints. (**1-2**). On the curved part of the shape make an indentation of at least 2".

> Apply the shape on the box opening the indentation onto the body of the valve. Fix the finishing with adhesive (**3-5**).

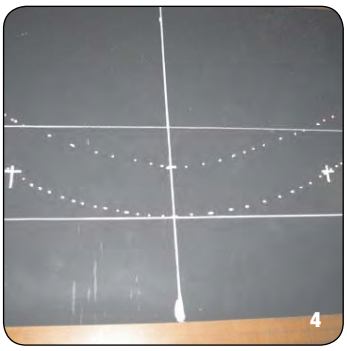
Where specified or requested, procede with the sealing of joints with an approved marine-grade sealant.

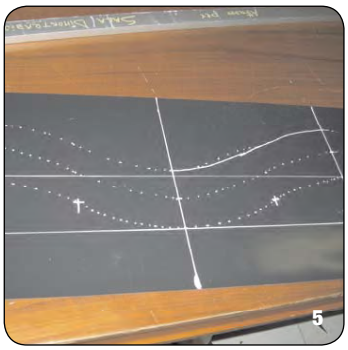
KEY 420 adhesive Measurements Actions

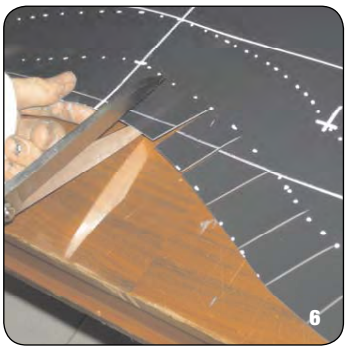
PIPES WITH CONTACT ADHESIVE: VALVES

1. APPLYING K-FLEX CLAD IN JACKETING ONTO VALVES
To fix the K-FLEX CLAD IN Jacketing on valves, proceed as follows:
> Measure the distance between the disc and the existing lagging at its nearest and furthest point (fig. 1).
> Mark the two different measurements on the dividing lines of the tracing as illustrated, then draw the intersecting lines from one extremity of the shape to the other (fig. 2).

> Using the difference in the two lengths as a radius, draw circles around the ends of the lines. Using the arcs of the circles, draw a continuous line linking them up, as illustrated in figure 3.







> Add a third line that will be used as a guide to make the fringes (figs. 4 - 5).

> Proceed by making longitudinal cuts as shown in figure 6.
> Apply the K-FLEX CLAD IN Jacketing as shown in figures 7 and 8.

PIPES WITH CONTACT ADHESIVE: VALVES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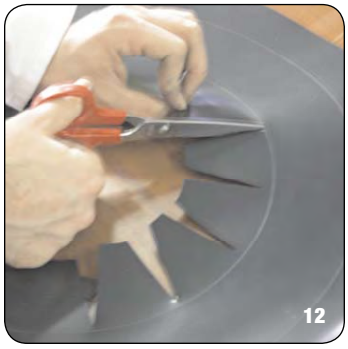
> Use K-FLEX 420 adhesive to fix the K-FLEX CLAD IN Jacketing onto the insulation.
> Apply the adhesive onto both the K-FLEX CLAD IN Jacketing and the insulation with a brush (fig. 9).

Note: Wait until the adhesive is almost dry before proceeding with the installation.

> Using pressure, firmly seal down all the previously prepared fringes.

2. PREPARING K-FLEX CLAD IN SIDE DISKS OF VALVES
> Measure the internal and external diameters of the valve.
> Using a compass, mark out the measurements of both the internal and external diameters onto a sheet of K-FLEX CLAD IN. Add 2" to the external diameter and trace a third circle that will be used for the overlap (fig. 11).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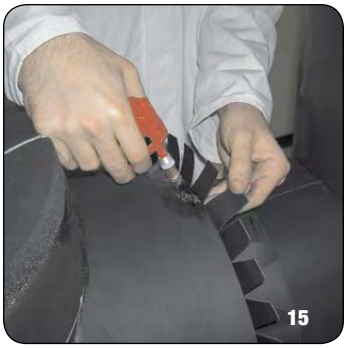
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> Using a sharp knife, cut out around the external circumference to obtain the disk.
> Make internal and external fringes in the disk as indicated in figures 12 and 13.
> The disk is now ready to be mounted onto the valve (fig. 14).
> Repeat the operation to cover the other side of the valve.
> Make an opening cut in the disk and slot it onto the valve.

> Use K-FLEX 420 adhesive to seal the disc onto the valve (fig. 15).

PIPES WITH CONTACT ADHESIVE: VALVES


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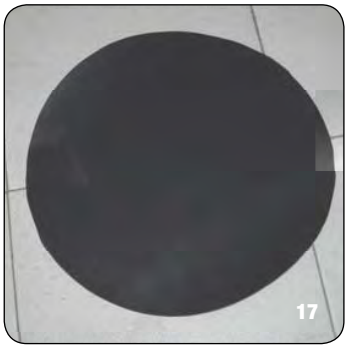
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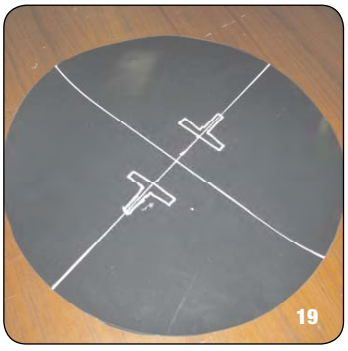
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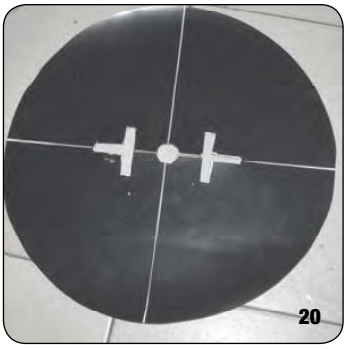
> Using pressure, fix down the disk fringes (previously spread with K-FLEX 420 adhesive) in order to obtain a perfect mechanical grip.
> When the disk is installed, it should appear as in figure 16.

> On the previously prepared K-FLEX CLAD IN disk, carefully draw out the protruding parts of the valve's cover (figs. 18 - 19).

APPLYING K-FLEX CLAD IN JACKETING ONTO VALVE COVERS

Now proceed to make the valve cover with K-FLEX CLAD IN.
> With a compass, take the measurements of the valve's diameter.
> Transfer the measurements onto a sheet of K-FLEX CLAD IN.
> Cut the disc as shown in figure 17.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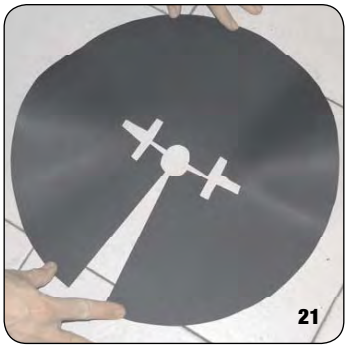
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> With a sharp knife cut out the shapes and make an opening cut (figs. 20 - 21).

> Proceed to install the disk, sealing it onto the valve with K-FLEX 420 adhesive (figs. 22 - 23).

PIPES WITH CONTACT ADHESIVE: VALVES

> Proceed by spreading K-FLEX 420 adhesive over all the valve's K-FLEX CLAD IN joints (figs. 24 - 26).

> Prepare a strip of K-FLEX CLAD IN sheet to apply around the valve's circumference as illustrated in figure 27.

> Using K-FLX 420 adhesive, seal the K-FLEX CLAD IN strip onto the valve.

3. APPLYING MARINE SEALANT*:
> Spread a 1/2" layer of an approved marine-grade sealant over both sides of all joints.
> Proceed carefully as shown in figure 31.

* Where specified or requested.

ALTERNATIVE METHOD: HEAT GUN*

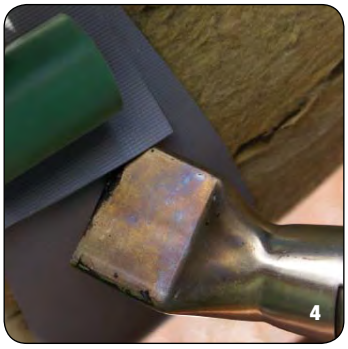
*NOTE: K-FLEX USA recommends using adhesive for sealing Clad IN Jacketing over most insulation types, including flexible elastomeric foam. Contact K-FLEX technical support before practicing the heat welding method.

1. INSTALLATION OF STRAIGHT PIPE RUN

> Always use proper protective equipment when using a heat gun (i.e. gloves, goggles, etc.). The proper amount of heat for each application depends on the specific heat gun used, temperature range selected, distance between the nozzle and the sealing surface, the length of time heat is applied. Follow manufacturer's recommended guidelines, do not use near flammable liquids or in explosive atmospheres, shield materials around heated area, do not cut off air flow by placing nozzle too close to work surface, and place the heat gun on a stable, level surface when not hand held. Use caution when using heat gun. Keep heat gun moving to prevent excessive temperatures. Keep work environment clean.

> Set the temperature of the Heat Gun to 482°F (250°C). The surface temperature of the CLAD IN Jacketing must be heated above 257°F (125°C) to achieve bonding.

> Apply predimensioned layer of CLAD IN Jacketing on the insulation, leaving the usual excess of roughly 2" for the longitudinal overlap (fig. 3).



Proceed as follows on all the joints indicated in figures 4 and 5:

> Once the Heat Gun reaches the operating temperature, bring it to the jacket, holding it for 20 - 30 seconds, at about 3/4" from the surfaces to be bonded. Once the surfaces are heated, use a plastic roller to apply pressure to the top surface to ensure good contact with the lower surface. Continue this procedure until the entire joint is sealed.

> Where specified or requested, procede with sealing joints with an approved marine-grade sealant.

HEAT GUN

Heat Gun Recommendations;
Design Specification:
Volts: 120
Temperature Range: 140°F to 1004°F (60°C to 540°C)
Air Flow: 14.8 CFM

Heat guns manufactured by Leister (Triac AT), or similar should be used.