

Mounting Instructions Perlite Coupling

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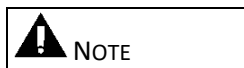
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I. STRUCTURE OF THE MANUAL / CLARIFICATION

The various aspects of this manual are clearly listed here. Points of attention are marked throughout the entire manual in the following way (the interpretation is also given):



Offers suggestions/advice to the mechanic in order to perform certain tasks more easily.



Points out possible problems to the mechanic.



Indicates damage to the system or directly linked equipment when the mechanic does not carefully adhere to the procedures.



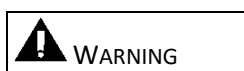
Warns the mechanic of possible injuries if the procedures are not adhered to properly.



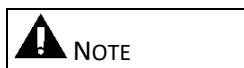
The life of the mechanic is directly threatened.

II. GENERAL TERMS

**Demaco Holland bv considers the mechanic to be:
the one who operates the machine or equipment supplied by Demaco Holland bv.**



The mechanic is responsible for the safety of any assisting employees. The mechanic must ensure, before starting the machine or application that no dangerous situation can occur for the assisting employees.



This user manual must be read by the mechanic as soon as possible in order for him to become familiar with the operation of this equipment.

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III. SAFETY AND HEALTH CONCERNS

From the point of view for injuries to the mechanic(s) specific attention is given to the dangers that can occur when using liquid gasses like; Nitrogen, Oxygen, Argon.

On equipment delivered by Demaco Holland bv on locations where the mechanic may come into contact with extreme cold (liquid) gasses, you can find one or more labels as shown below. It warns the mechanic of the presence of coldness, electrical danger or entrapment hazard and it is indicated that safety glasses and gloves with wrist protection should be worn.



figure 1; *Safety label on Demaco Holland bv products*

This user manual should at least be available for consultation at the head of the department. We also recommend that a copy is made of this manual, inserted in plastic folders or bound, and put on view at location with the control cabinet.

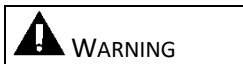
We also recommend to carefully read the Demaco safety instruction “Safety guidelines for working with cold media”. Extensive information is provided in this manual about working with cryogenic media. A copy of the “safety instruction” is shipped with this delivery. Should you require more copies of this instruction in order to create a safe working environment for your mechanic(s), additional copies can be requested from Demaco Holland bv. contact our sales department.

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1 INTRODUCTION

This mounting instructions applies to vacuum insulated piping delivered by Demaco Holland bv which are connected by means of Perlite couplings.

For safety instructions about the handling, managing and use of perlite we refer you to the EIGA 703/05 "PERLITE MANAGMENT" which is a globally harmonised document and free available for download.



You must read these two instruction before starting the mounting the couplings.

2 GENERAL INSTRUCTIONS

Before you start mounting the pipes properly check the isometric drawing. Identify the routing as well as the individual sections needed for this project. Sections are recognizable on the isometric by means of a unique number with a double circle around it. The location of the couplings is mentioned by means of two stripes close to each other with a bullet in the middle. Left and right of these stripes a section number should be placed.



figure 2; *Symbol for section (x = number) and location of perlite coupling*

This section number in combination with the project number (can be found on the right bottom side of the drawing frame) is a unique combination. On each packed section, this project number and section number are etched near the pump valve and can be read even when the packaging is still applied.

Do not remove the packaging until the moment of final fitting. This prevents dirt and moisture from entering the piping sections. In case of multiple sections, we recommend that you first sort the sections by pipe line number, before proceeding with mounting.

If all sections are identified and sorted check the required parts necessary to complete the Perlite couplings. To find the correct parts a reference is made in the part list on the isometric. The detail drawing of the coupling(s) which is necessary to connect the spools. Part items can be found on these mono/detail drawings of the Perlite coupling connections.

The jackets for the perlite couplings do not have a unique section number. Sometimes you can find the detail drawing number and the position number engraved in the jacket.

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For each perlite coupling you need to at least have:

- 2x Vacuum Insulated Pipe sections with heat bridge (fig.3, pos.4) and weld-on ring (fig.3, pos.3)
- 1x Jacket (fig.3, pos.1)
- 1x Socket $\frac{3}{4}$ " (fig.3, Pos.5)
- 1x Breather cap $\frac{3}{4}$ " (fig.3, pos.6)
- 1x Safety valve complete (fig.3, pos.7)
 - Safety valve plastic cover cap
 - Safety valve housing
 - Safety valve plug
 - Quad ring
 - Shaft $\varnothing 2$ mm
- 1x Perlite insulation material (fig.3, Pos.2)

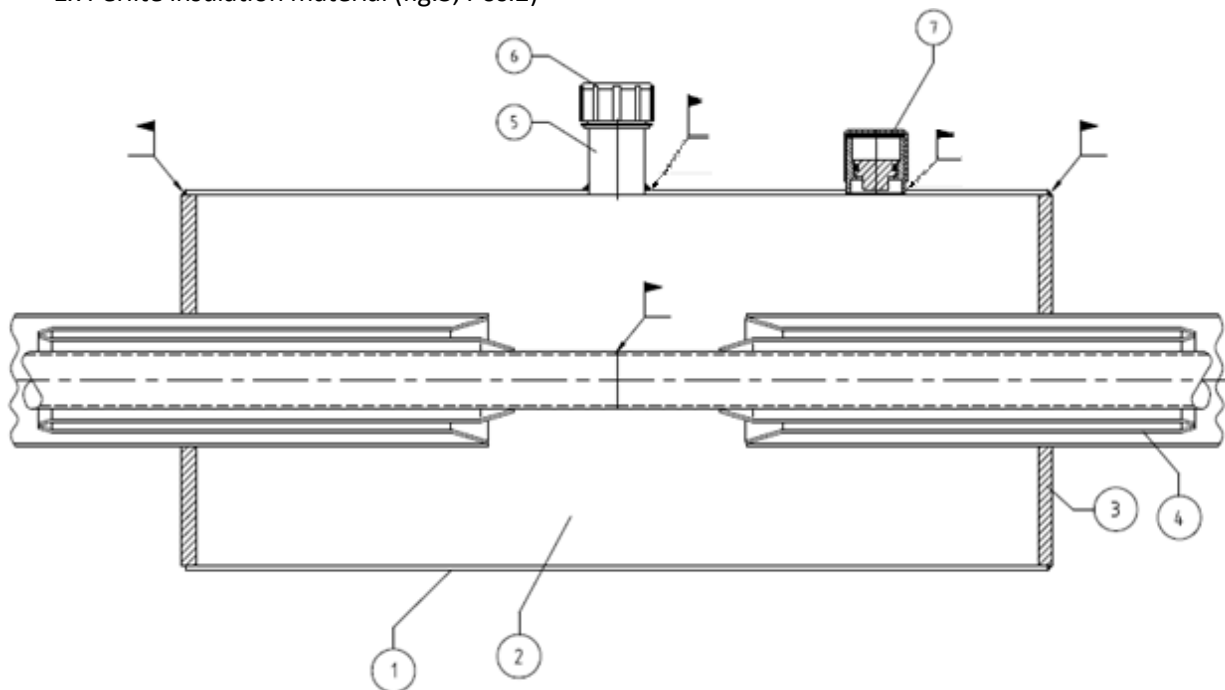
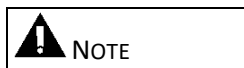


figure 3; *Straight welded Perlite coupling*

The diameter of the jacket is such that it fits exactly over the weld-on rings. The pump valves and $\frac{3}{4}$ " socket are delivered separately, and are all identical.



Do not weld the pump valve onto the jacket before the jacket is placed on his final position between two sections. Once the pump valve house and/or $\frac{3}{4}$ " socket are welded onto the jacket, the jacket can no longer be slid over the welding rings.

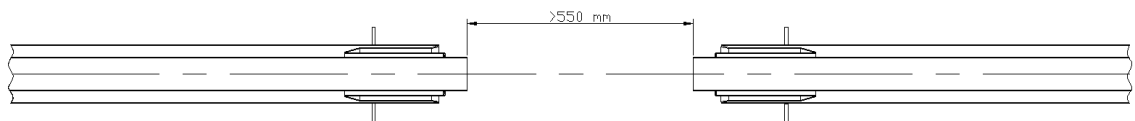
Depending on the routing of the piping a starting point for the fitting process can be selected. This does not necessarily need to be at section number 1.

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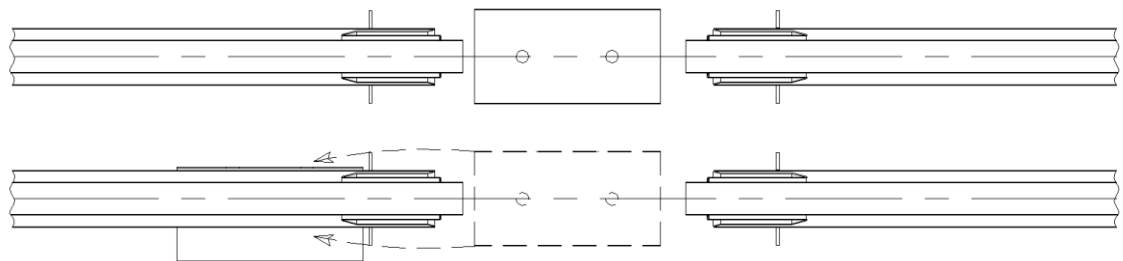
3 MOUNTING INSTRUCTIONS

3.1 Straight coupling - Horizontal

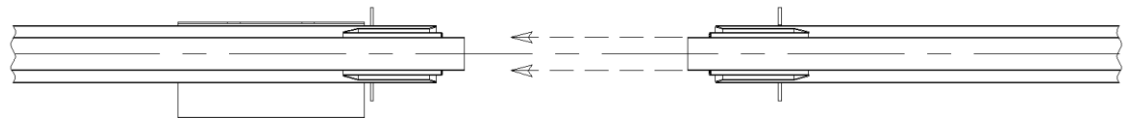
Step 1: Place the chosen start section on the supports, and position the following section with an interim distance of minimum 550 mm onto the supports too. Remove the packaging from the ends of the sections. Check for possible contamination at the section ends. In case of doubt, clean the ends with a clean piece of paper or cloth. In heavily contaminated environments and during rain, we recommend that you perform the fitting inside a tent, or to shield of the environment using screens.



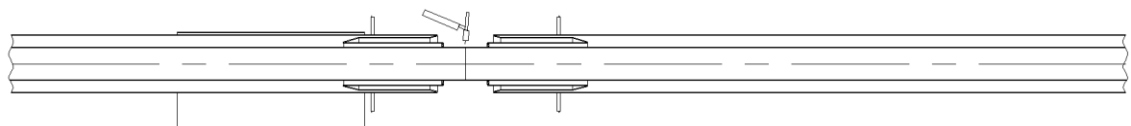
Step 2: Position the jacket between the two sections and slide the jacket to one side past the weld ring



Step 3: Now slide the two sections with the inner piping against one another.



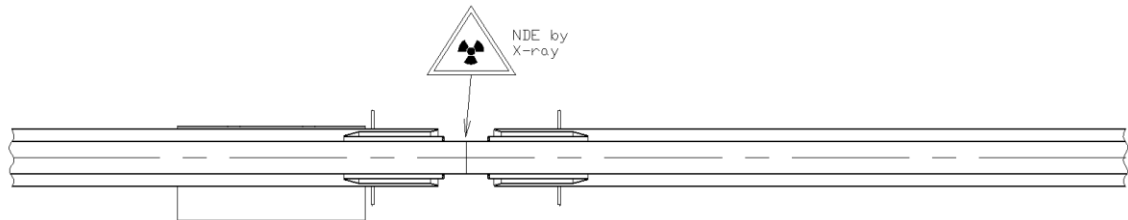
Step 4: Now weld the process pipes to each other by using TIG or TIG+MAG. Before start welding the inner pipe, the inner pipe must be filled with backing gas. This gas prevents the burning of the material of the inner piping around the weld. Ensure that a constant flow of backing gas flows through the welding seam during welding. Once this is ensured, the inner piping can be welded all around



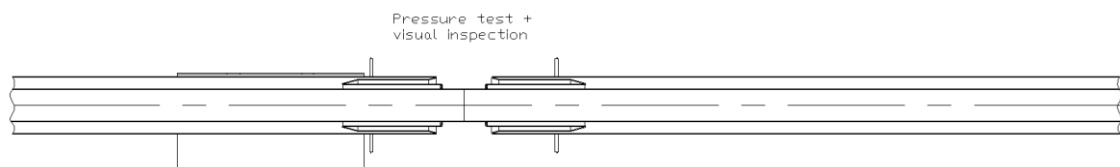
Make sure you make a complete full penetration butt weld

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Step 5: The weld can after it has cooled, tested for welding defects by X-ray and/or additional testing by means of Dye Penetrant



Step 6: Perform additional pressure testing in combination with a visual weld inspection on each welding seam.



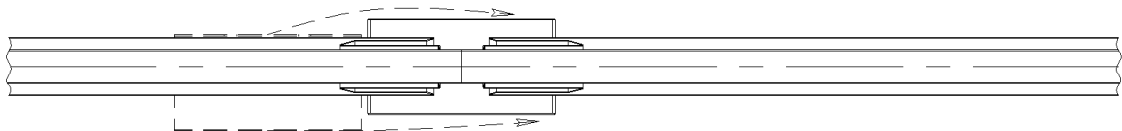
Step 7: Clean the discolouration of the weld with a **Stainless Steel** wire brush until it is metallic bright. The remnants of the dye penetrant liquid can be washed away with clear potable water.

Step 8: Check if the loose jacket has the correct length by sliding the jacket over the weld –on rings. On both sides the jacket should be supported on the weld-on rings. If correct continue with step 9. If not there are now two options:

1. If the loose jacket is too long use a grinder to reduce the length to a correct length. The correct length is the outside dimension between the weld-on rings minus two times the jacket thickness. For example: $500 - 2 \times 3 = 494$ mm
2. When the jacket is too short cut a small ring with the correct length from the spare pipe and cut this open over the length on one side. Slide this over the process pipe and extend the pipe by means of welding.



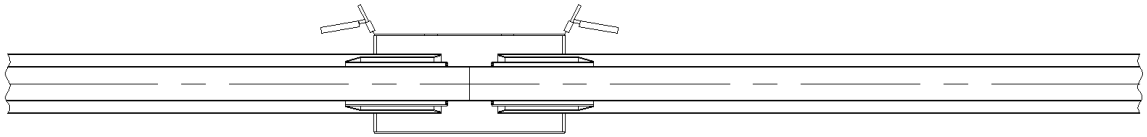
When the required extension pipe is less than 25 mm you have to shorten the jacket to create an acceptable welding distance between two welds. Don't hit the vacuum insulated pipe sections with the grinder. This could result in losing vacuum!



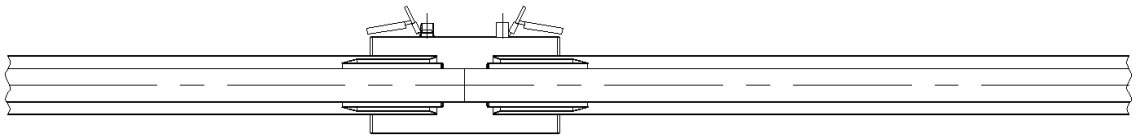
Step 9: De-grease the outside of the process pipe, inside openings of the heat bridges and the jacket of the sections using a cloth soaked in alcohol. Also clean the loose jacket pipe on the inside and slide the jacket onto the weld-on rings and centralise the jacket in the middle with even spacing on both sides.

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Step 10: Rotate the Jacket in such a position that the openings are pointed vertical upwards and weld the jacket to the ring on both sides by using TIG or MAG and create a fillet weld all around.



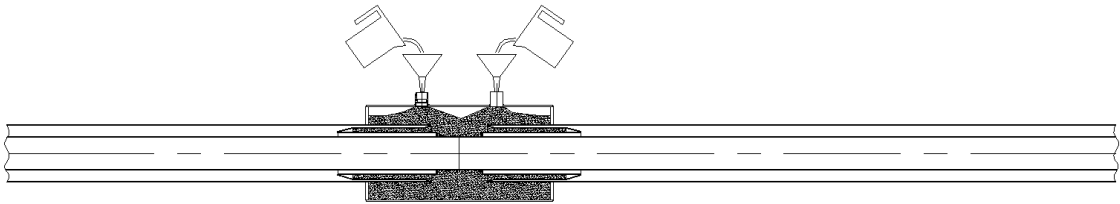
Step 11: When the jacket is welded place the safety valve housing in one hole and weld this into the jacket. Do this the same for the 3/4" socket in the second hole. You should have 1 socket and 1 safety valve house per coupling



Step 12: Clean the welds with a **stainless steel** wire brush until metallicly bright.

Step 13: In case moisture or water entered the inside of the coupling, please make sure you dry the coupling by blowing hot air through one of the filling point using a hot air gun (up to about 200°C).

Step 14: Place a funnel in one or both of the openings and fill the space inside the coupling with perlite by using a pour or measuring cup. Make sure the perlite is dry to avoid moisture getting trapped in the coupling and clumps are crumbled to loose perlite.



Step 14a: Tap calm on the side of the jacket with the white rubber hammer to make sure that all opening are filled up with perlite. The vibrations of the tapping will make sure that all openings are filled since perlite is very light. Fill up until the perlite reaches the bottom of the housing of the safety valve and the socket.

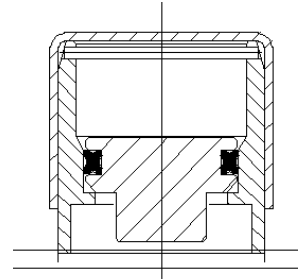
Step 14b: Insert the short rigid part of the metal flex through the safety ring and the funnel into the jacket. Connect the long rigid part into the head of a battery powered drilling tool (max. rotational speed 1000 rpm). Will rotating move the flex up and down. The rotating vibrations will spread the perlite inside more towards the dead ends.

If too much perlite is inside the house or socket use your finger to press it in deeper or take the overflow out.

Step 15: Place the breather cap into the socket and screw it in by hand force.

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- Step 16:
- Grease the quad ring lightly with the vacuum grease and place the quad ring on the plug.
 - Clean the inside of the housing and make sure the housing contains no perlite powder in the chamber of the housing.
 - Firmly press the plug into the housing until it is positioned flat into the bottom.
 - Place the 2 mm shaft through the small openings
 - Seal the safety valve by means of the plastic cap.



3.2 Straight coupling – Vertical

For pictures about each step see page 12 and 13

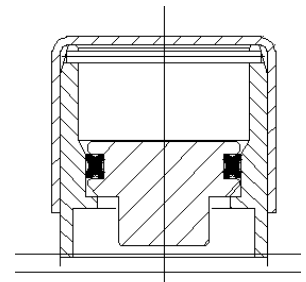
- Step 1: Place the chosen start section on the supports. Remove the packaging from the ends of the sections. Check for possible contamination at the section ends. In case of doubt, clean the ends with a clean piece of paper or cloth. In heavily contaminated environments and during rain, we recommend that you perform the fitting inside a tent, or to shield of the environment using screens.
- Step 2: Position the jacket above the lower pipe section and slide the jacket over the lower weld-on ring
- Step 3: Now slide the two sections with the inner piping against one another.
- Step 4: Now weld the process pipes to each other by using TIG or TIG+MAG. Before start welding the inner pipe, the inner pipe must be filled with backing gas. This gas prevents the burning of the material of the inner piping around the weld. Ensure that a constant flow of backing gas flows through the welding seam during welding. Once this is ensured, the inner piping can be welded all around. Make sure you make a complete full penetration butt weld
- Step 5: The weld can after it has cooled, tested for welding defects by X-ray and/or additional testing by means of Dye Penetrant
- Step 6: Perform additional pressure testing in combination with a visual weld inspection on each welding seam.
- Step 7: Clean the discolouration of the weld with a **Stainless Steel** wire brush until it is metallic bright. The remnants of the dye penetrant liquid can be washed away with clear potable water.
- Step 8: Check if the loose jacket has the correct length by sliding the jacket over the weld –on rings. On both sides the jacket should be supported on the weld-on rings. If correct continue with step 9. If not there are now two options:
- If the loose jacket is too long use a grinder to reduce the length to a correct length. The correct length is the outside dimension between the weld-on rings minus two times the jacket thickness. For example: $500-2 \times 3 = 494$ mm
 - When the jacket is too short cut a small ring with the correct length from the spare pipe and cut this open over the length on one side. Slide this over the process pipe and extend the pipe by means of welding.

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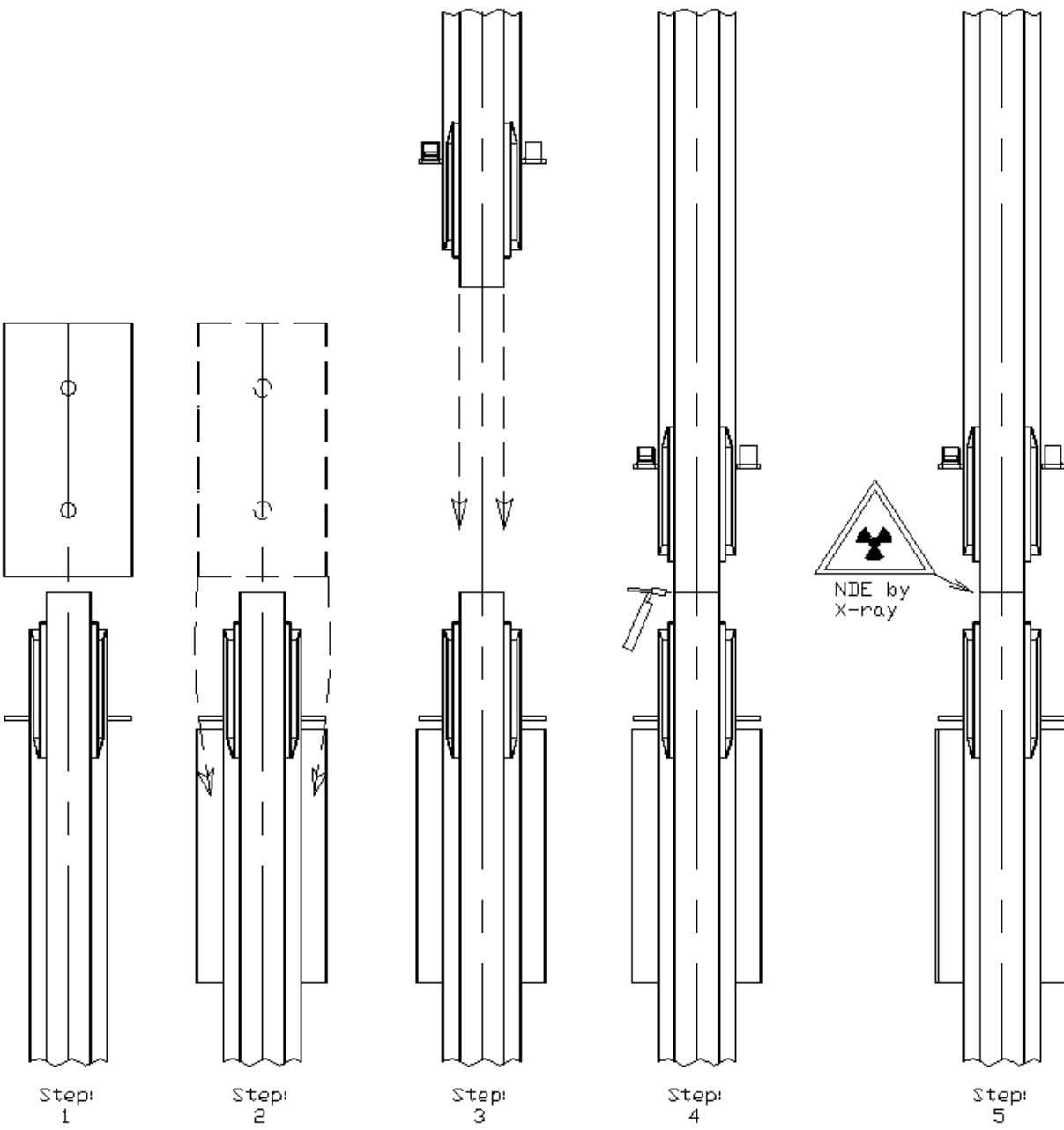


When the required extension pipe is less than 25 mm you have to shorten the jacket to create an acceptable welding distance between two welds. Don't hit the vacuum insulated pipe sections with the grinder. This could result in losing vacuum!

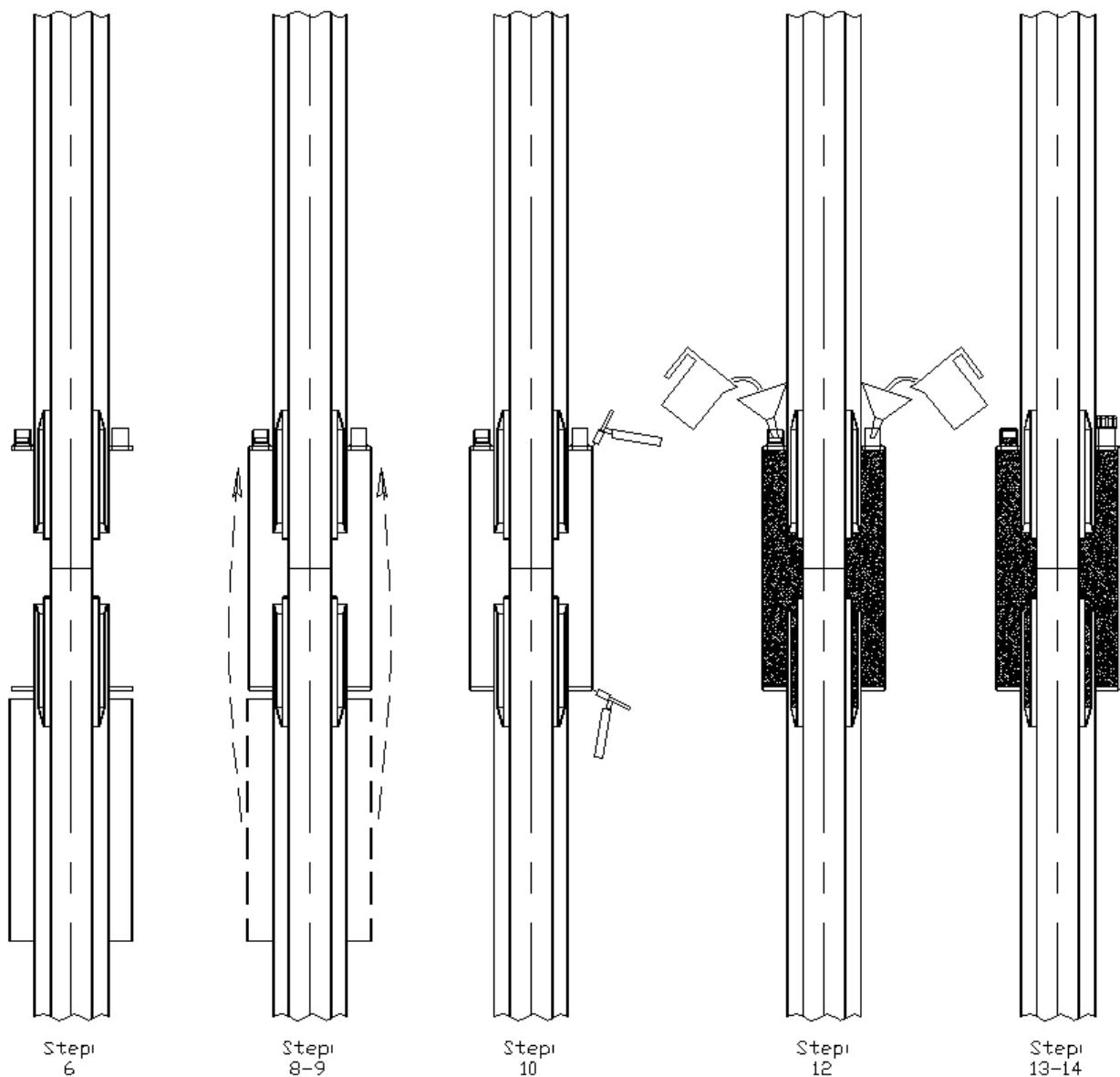
- Step 9: De-grease the outside of the process pipe, inside openings of the heat bridges and the jacket of the sections using a cloth soaked in alcohol. Also clean the loose jacket pipe on the inside and slide the jacket onto the weld-on rings and centralise the jacket in the middle with even spacing on both sides.
- Step 10: Weld the jacket to the ring by using TIG or MAG and create a fillet weld all around.
- Step 11: Clean the welds with a **stainless steel** wire brush until metallicly bright.
- Step 12: In case moisture or water entered the inside of the coupling, please make sure you dry the coupling by blowing hot air through one of the filling point using a hot air gun (up to about 200°C).
- Step 13: Place a funnel in one or both of the openings and fill the space inside the coupling with perlite by using a pour or measuring cup. Make sure the perlite is dry to avoid moisture getting trapped in the coupling and clumps are crumbled to loose perlite.
- Step 13a: Tap calm on the side of the jacket with the white rubber hammer to make sure that all opening are filled up with perlite. The vibrations of the tapping will make sure that all openings are filled since perlite is very light. Fill up until the perlite reaches the bottom of the housing of the safety valve and the socket.
- Step 13b: Insert the short rigid part of the metal flex through the safety ring and the funnel into the jacket. Connect the long rigid part into the head of a battery powered drilling tool (max. rotational speed 1000 rpm). Will rotating move the flex up and down. The rotating vibrations will spread the perlite inside more towards the dead ends.
- If too much perlite is inside the house or socket use your finger to press it deeper or take it out.
- Step 14: Place the breather cap into the socket and screw it in by hand force.
- Step 15: a. Grease the quad ring lightly with the vacuum grease and place the quad ring on the plug.
 b. Clean the inside of the housing and make sure the housing contains no perlite powder in the chamber of the housing.
 c. Firmly press the plug into the housing until it is positioned flat into the bottom.
 d. Place the 2 mm shaft through the small openings
 e. Seal the safety valve by means of the plastic cap.



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3.3 Elbow coupling – Horizontal or vertical

For pictures about each step see page 16 and 17

Step 1: Place the chosen start section on the supports. Remove the packaging from the ends of the sections. Check for possible contamination at the section ends. In case of doubt, clean the ends with a clean piece of paper or cloth. In heavily contaminated environments and during rain, we recommend that you perform the fitting inside a tent, or to shield of the environment using screens.

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Step 2: Slide the correct jacket over the first section. Make sure the holes are always facing upwards.



There are different jacket models namely with and without holes. If one of the two sections for that coupling has a weld-on ring with pre-welded socket and safety valve house the jackets are without holes. If not you should check the detail drawing which can be found on the isometric.



If you have a jacket on a detail drawing with two holes in one chamfered jacket (only applicable for elbow couplings) the jacket with two holes should be positioned on the highest section to allow filling with perlite

Step 3: Place the second section on the supports. Remove the packaging from the ends of the sections. Check for possible contamination at the section ends. In case of doubt, clean the ends with a clean piece of paper or cloth. In heavily contaminated environments and during rain, we recommend that you perform the fitting inside a tent, or to shield of the environment using screens.

Step 4: Slide the correct jacket over the second section. Make sure the holes are always facing upwards.



There are different jacket models namely with and without holes. If one of the two sections for that coupling has a weld-on ring with pre-welded socket and safety valve house the jackets are without holes. If not you should check the detail drawing which can be found on the isometric.



If you have a jacket on a detail drawing with two holes in one chamfered jacket (only applicable for elbow couplings) the jacket with two holes should be positioned on the highest section to allow filling with perlite

Step 5: Now slide the second section towards the corner and align this with by using the elbow with the inner piping against one another.

Step 6: Now weld the process pipes to each other by using TIG or TIG+MAG. Before start welding the inner pipe, the inner pipe must be filled with backing gas. This gas prevents the burning of the material of the inner piping around the weld. Ensure that a constant flow of backing gas flows through the welding seam during welding. Once this is ensured, the inner piping can be welded all around. Make sure you make a complete full penetration butt weld

Step 7: The welds can after it has cooled, tested for welding defects by X-ray and/or additional testing by means of Dye Penetrant

Step 8: Perform additional pressure testing in combination with a visual weld inspection on each welding seam.

Step 9: Clean the discolouration of the welds with a **Stainless Steel** wire brush until it is metallic bright. The remnants of the dye penetrant liquid can be washed away with clear potable water.

Step 10: Check if the loose jackets has the correct length and angle by sliding both jackets over the weld –on rings. The two jackets should fit when pressing together. On both sides the jacket should be supported on the weld-on rings. If correct continue with step 11. If not there are now two options:

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1. If the loose jacket is too long or has an incorrect angle use a grinder to adjust the length or angle. The correct length is the outside dimension between the weld-on rings minus two times the jacket thickness. For example: $500 - 2 \times 3 = 494$ mm
2. When the jacket is too short cut a small ring with the correct length from the spare pipe and cut this open over the length on one side. Slide this over the process pipe and extend the pipe by means of welding.



When the required extension pipe is less than 25 mm you have to shorten the jacket to create an acceptable welding distance between two welds. Don't hit the vacuum insulated pipe sections with the grinder. This could result in loosing vacuum!

Step 11: De-grease the outside of the process pipe, inside openings of the heat bridges and the jacket of the sections using a cloth soaked in alcohol. Also clean the loose jacket pipe on the inside and slide the jacket onto the weld-on rings and centralise the jacket in the middle with even spacing on both sides.

Step 12: Weld the jacket to the ring by using TIG or MAG and create a fillet weld all around.



If you are preparing a perlite coupling of which the weld-on ring contains a socket and safety valve housing. With other words you have two jackets without holes skip the next step 13

Step 13 When the jacket is welded place the safety valve housing in one hole and weld this into the jacket. Do this the same for the $\frac{3}{4}$ " socket in the second. You should have 1 socket and 1 safety valve house per coupling

Step 14: Clean the welds with a **stainless steel** wire brush until metallicly bright.

Step 15: In case moisture or water entered the inside of the coupling, please make sure you dry the coupling by blowing hot air through one of the filling point using a hot air gun (up to about 200°C).

Step 16: Place a funnel in one or both of the openings and fill the space inside the coupling with perlite by using a pour or measuring cup. Make sure the perlite is dry to avoid moisture getting trapped in the coupling and clumps are crumbled to loose perlite.

Step 16a: Tap calm on the side of the jacket with the white rubber hammer to make sure that all openings are filled up with perlite. The vibrations of the tapping will make sure that all openings are filled since perlite is very light. Fill up until the perlite reaches the bottom of the housing of the safety valve and the socket.

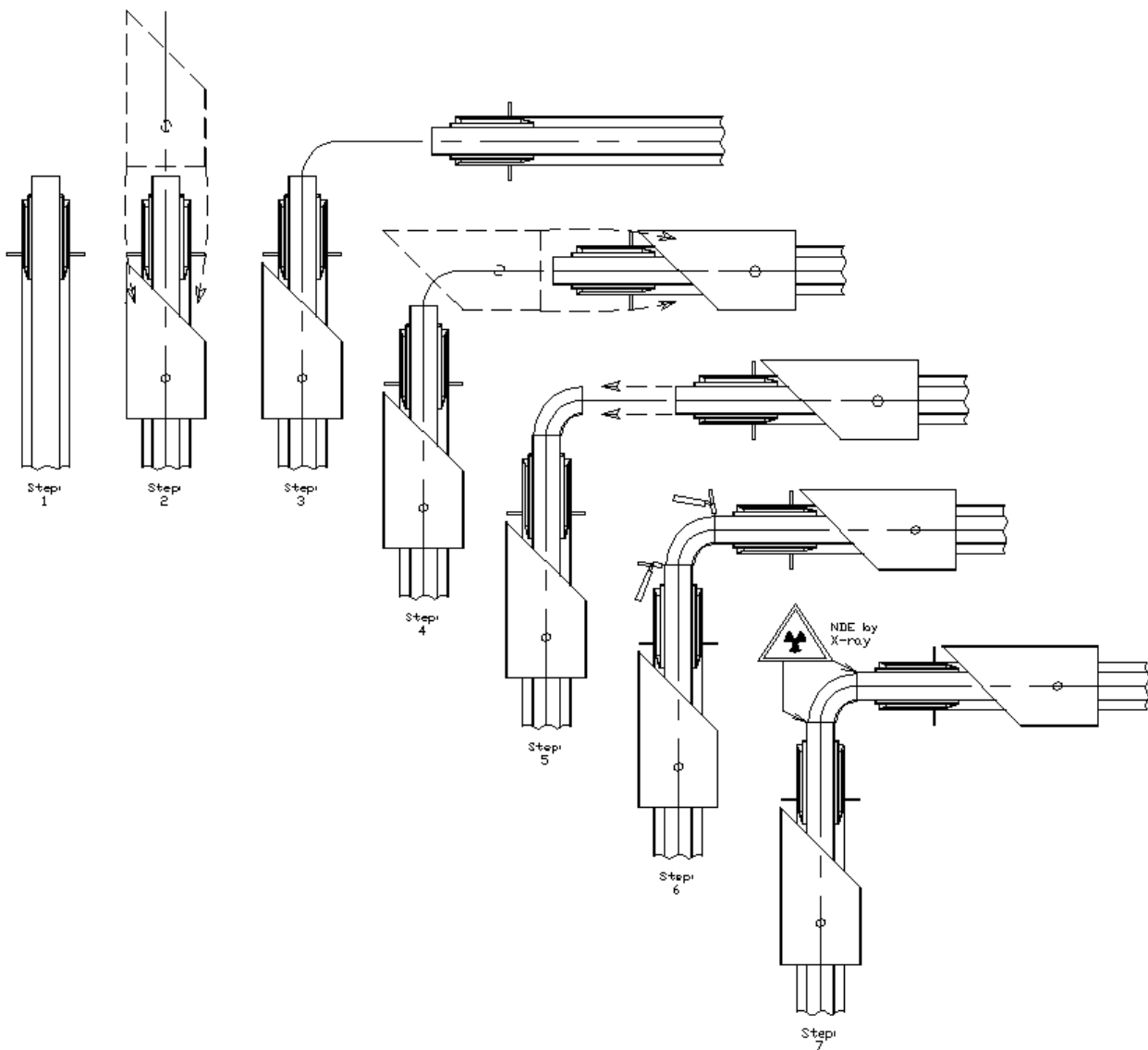
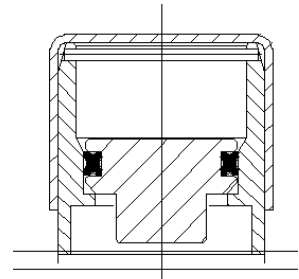
Step 16b: Insert the short rigid part of the metal flex through the safety ring and the funnel into the jacket. Connect the long rigid part into the head of a battery powered drilling tool (max. rotational speed 1000 rpm). Will rotating move the flex up and down. The rotating vibrations will spread the perlite inside more towards the dead ends.

If too much perlite is inside the house or socket use your finger to press it in deeper or take it out.

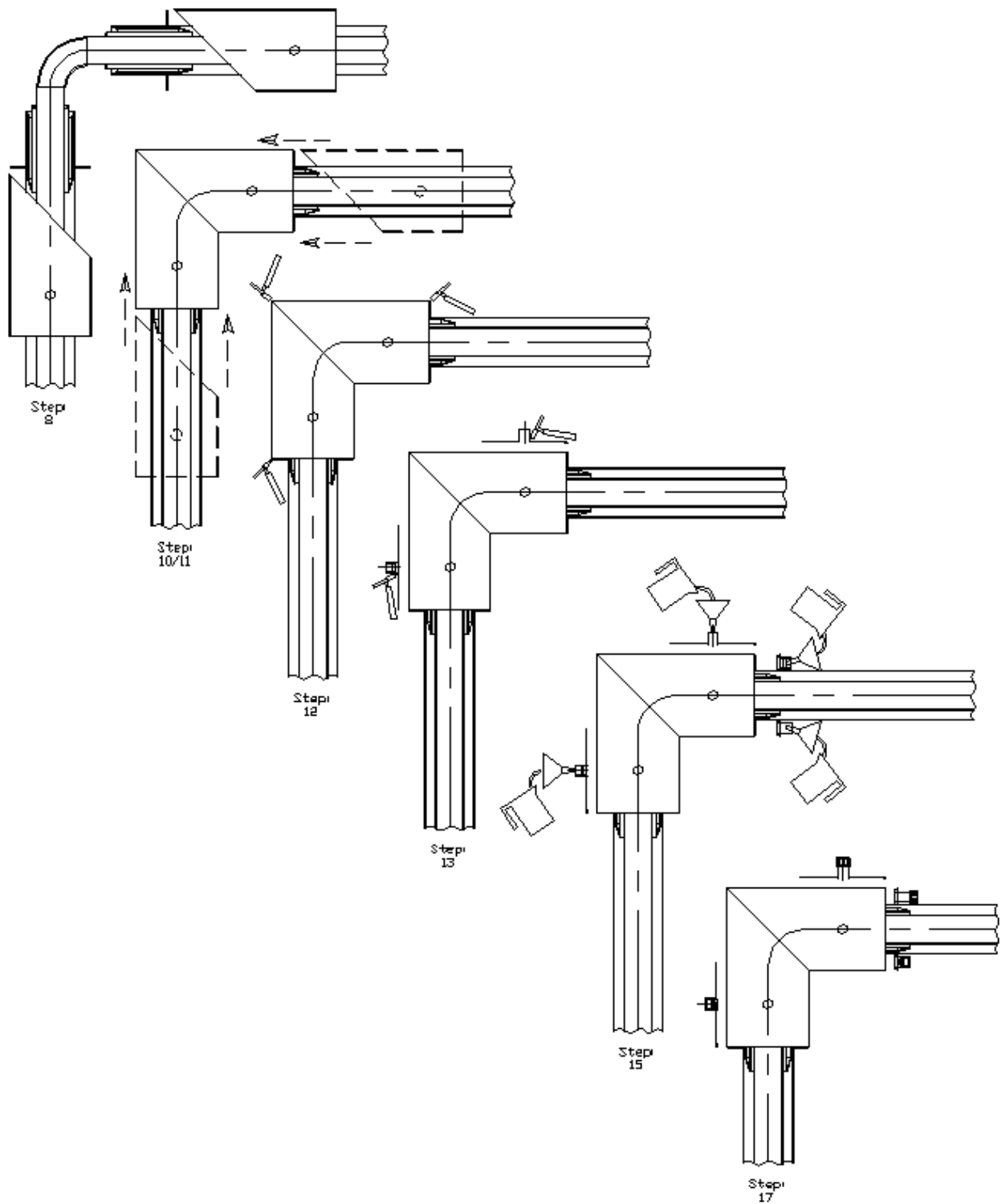
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Step 17: Place the breather cap into the socket and screw it in by hand force.

- Step 18:
- Grease the quad ring lightly with the vacuum grease and place the quad ring on the plug.
 - Clean the inside of the housing and make sure the housing contains no perlite powder in the chamber of the housing.
 - Firmly press the plug into the housing until it is positioned flat into the bottom.
 - Place the 2 mm shaft through the small openings
 - Seal the safety valve by means of the plastic cap.



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4 SECTIONS WITH OVER- OR UNDERLENGTH OF THE PROCESS PIPE

The above mentioned steps are only applicable when welding sections to each other where the process pipe has the correct length. Due to temperature, misalignment, additional over length from factory or other effects it can happen that the spools are too long or too short when mounting.

Below description is an addition to Step 3 for straight couplings and Step 5 for elbow couplings

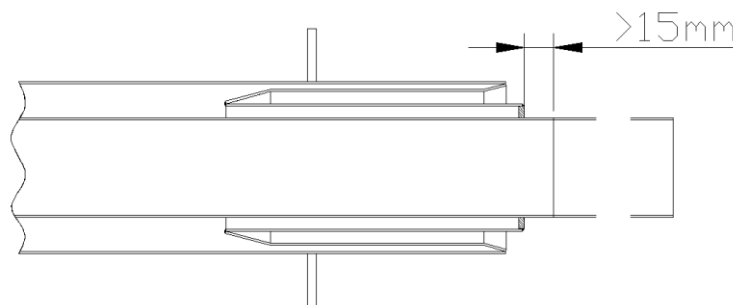
4.1 Over length (to long)

When the process pipe (smallest pipe) is too long follow the next steps.

1. Remove any plastic and or caps
2. Inspect if nothing is inside the pipe
3. Place a plug of clean paper or cloth into the process pipe not deeper than 5-8 cm than the required end length. This is to prevent than grinding material or metal parts are falling into the pipe.
4. Shorten the pipe by using a saw or grinder
5. Smoothen the sharp edges with the grinder or a half-round or round file
6. Take out the paper or cloth plug
7. Use new clean paper cloth soaked in alcohol to clean the inside and outside of the pipe
8. Inspect if the pipe is clean and no material particles felled into the pipe
9. Continue with the next step as described in chapter 3.1, 3.2 and 3.3



There should be a minimum distance of 15 mm between the heat bridge and the weld to be made of the process pipes.



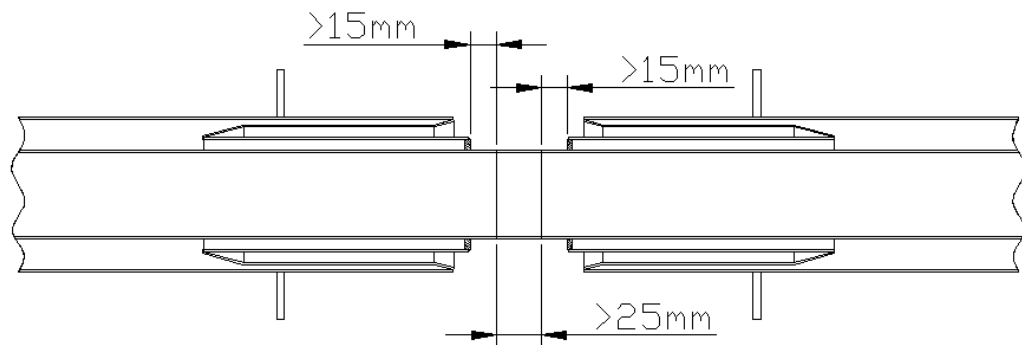
4.2 Under length (to short)

When the pipe is too short you have to cut a small ring with the correct length from spare pipe and weld this in between.



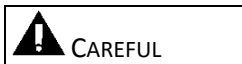
There should be a minimum distance of 25 mm diameter mm between each weld on the process pipe. When the distance between the welds is less than 25 mm you also should shorten the process pipe to allow a ring of 25 mm. See above chapter 4.1 how to proceed when shortening pipes.

Mounting Instructions Perlite Coupling



5 STORAGE OF THE VACUUM-INSULATED PIPING

Vacuum-insulated piping must be stored dry and sealed and packed on open ends. Ensure that moisture and dirt are not able to enter the piping. The minimum storage temperature of the piping is in ambient conditions.



Ensure that the packaging and protection of the ends of the piping sections remains undamaged during transport and storage.

6 MAINTENANCE

Vacuum insulated spools

The maintenance of vacuum-insulated piping is limited to a visual inspection, once a month. Ice deposits on the outside jacket or on flanges of the couplings can indicate a decrease in the vacuum level in the vacuum space.

Under normal circumstances this decrease occurs after some years and is completely depending of the usage of the installed pipeline. As a result of the decrease of the vacuum level, the insulation heat transfer value increases creating a larger energy transition between the cold and warm. Thus ice becomes visible. The insulation is restored by re-vacumisation of the pipe section.

For a proper re-vacumisation, the piping must be empty, and should be brought up to at least ambient or room temperature. Depending on routing and size this warming up can take several hours or longer.

Perlite couplings

Maintenance on a perlite coupling only requires an inspection once every year on the safety valve and breather cap. Due to the loose material perlite can settle in time. This means that a small top-off could be required. Therefor remove the breather cap and fill up with perlite.

Service

Demaco Holland bv has all relevant equipment and expertise to perform this re-vacumisation for you. Demaco also sells re-vacumisation kits completer with pump, sensor, tools and manual to do this yourself. For more information about this please contact Demaco Holland bv