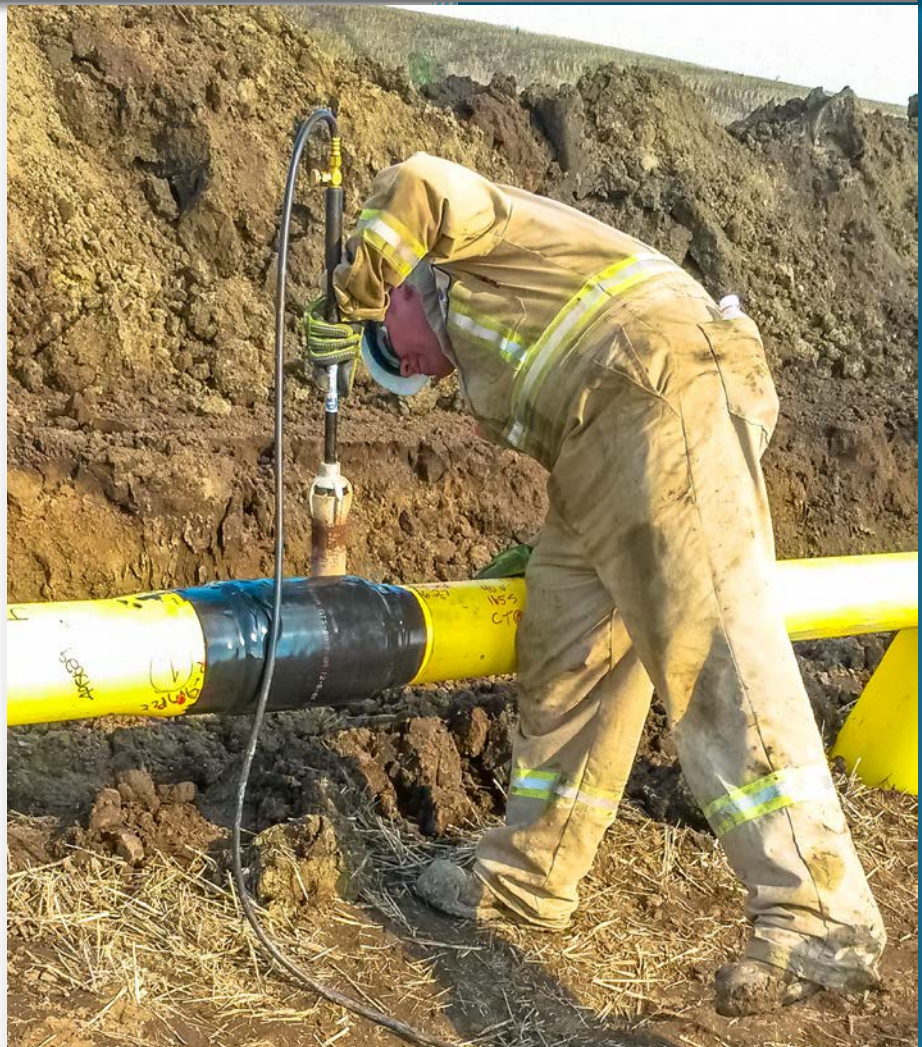




CORE LINEPIPE

External Coating Bulletin



CORE Linepipe

6/4/2018

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Attachments:

- MANUFACTURER’S QUALIFIED APPLICATION PROCEDURE (MQAP): CANUSA-CPS MS1F
- MANUFACTURER’S QUALIFIED APPLICATION PROCEDURE (MQAP): CANUSA-CPS CRPO
- MANUFACTURER’S QUALIFIED APPLICATION PROCEDURE (MQAP): CANUSA-CPS K-60
- MANUFACTURER’S QUALIFIED APPLICATION PROCEDURE (MQAP): CANUSA-CPS TBK-60

EXTERNAL COATING & HOLIDAY DETECTION

Holiday Detection (Jeeping)

- Holiday detection and jeeping is the responsibility of the pipeline contractor
- Standard industry holiday detection practices apply to CORE products



Figure 1 - Holiday Detection

Applying External Coating

General

- This document describes applying external coating on CORE Liner®, and includes:
 - Repair of external coating, performed at the factory or in the field.
 - Applying external coating on assembled ClickWeld® joints, performed in the field.

Products Used

CORE Linepipe® requires the use of the following products for external coating:

Activity	Product
Coating repair, damage size <1/2"	CANUSA-CPS MS1F
Coating repair, damage size 1/2" to 2"	CANUSA-CPS CRPO
Coating repair, damage size >2"	CANUSA-CPS K-60 Wrapid Sleeves™
Coating Clickweld® joints, open cut	CANUSA-CPS K-60 Wrapid Sleeves™
Coating Clickweld® joints, directional drilling	CANUSA-CPS TBK-60 Tunnel Bore Kit

CORE Linepipe® requires the use of the following shrink sleeves:

Activity	Product Name	Canusa Size ¹	Sleeve Width, mm
Coating repair, NPS 6" pipe ²	K-60 170-600 WW YE/T	170	600
Coating repair, NPS 8" pipe ³	K-60 230-600 WW YE/T	230	600
Coating repair, NPS 6" swage	K-60 230-600 WW YE/T	230	600
Coating repair, NPS 8" swage	K-60 280-600 WW YE/T	280	600
Coating Clickweld® joints, for NPS 6"	K-60 230-600 WW YE/T ⁴ TBK-60 230-600 BK/T ⁵	230	600
Coating Clickweld® joints, for NPS 8"	K-60 280-600 WW YE/T ⁴ TBK-60 280-600 BK/T ⁵	280	600

1. Canusa reference, not an actual dimension.
2. If the required shrink sleeve size is not readily available, shrink sleeves K-60 230-600 WW YE/T may be used instead.
3. If the required shrink sleeve size is not readily available, shrink sleeves K-60 280-600 WW YE/T may be used instead.
4. For open cut installations.
5. For directional drilling installations.

*The above materials can be used on both YJ and YJ2K coated pipes. Standard CORE Liner® product is rated to a maximum service temperature of 60°C. Please contact your CORE Linepipe® representative for applications requiring a service temperature above 60°C.

Overview

- CORE Liner® has a polyethylene liner inside the pipeline. Overheating the steel pipe can damage the plastic liner.
- CORE Clickweld® joints are larger than the OD of the pipe and require shrink sleeves sized for the Clickweld® joint.
- Only installers having a valid Canusa ticket for the specific product used are allowed to apply external coatings on CORE Linepipe® products.
- The procedure for installing external coatings on CORE Linepipe® products must follow Canusa's Manufacturer Qualified Application Procedure (MQAP), in addition to the CORE Linepipe® specific requirements outlined in this document.

CORE Linepipe® Best Practices

In principle, the application and functionality of typical pipeline external coatings are the same for CORE Liner®. In addition to following Canusa's Manufacturer Qualified Application Procedure (MQAP), the safe and effective use of external coatings with CORE Liner® requires some additional unique considerations:

1. Coating materials shall be transported, handled, and stored in accordance with the MQAP.
2. The application company shall be responsible to ensure the installers are trained by Canusa prior to the start of work. The training shall cover the appropriate Manufacturer's Qualified Application Procedure (MQAP) for the specific external coating product.
3. Only installers having a valid Canusa ticket for the specific product being used are allowed to install external coatings on CORE Linepipe® products.
4. A copy of Canusa's Manufacturer Qualified Application Procedure (MQAP) is available in each box of external coating materials.
5. The installers of the external coatings must be aware of the requirements as laid out in CSA Z245.30.
6. Each ClickWeld® joint has two plugs visible on the factory ring. Ensure both plugs are present prior to installing the shrink sleeve. Refer to Attachment 1 for further explanation.
7. It is required of the external coating installers to **record the relevant electrofusion number (EF # - for shrink sleeves at ClickWeld® joints) or pipe serial number (for repairs on pipe body) along with surface temperature measurements**. This information is to be provided to the CORE Linepipe® foreman and will be included in the pipeline quality control (QC) package.

- a. Please speak with the onsite CORE representative to obtain a QC data capture sheet.
 - b. See Attachment 2.
8. The surface preparation of the steel and the existing coating shall be in accordance with the MQAP. Grease may be present from the assembly of the ClickWeld®. Ensure any contaminants have been removed for effective adhesion of the external coating.
9. The ClickWeld® rings have abrupt shoulders. Contouring is required to allow effective shrink sleeve adhesion. CORE Linepipe® supplies Canusa-CPS mastic filler/AquaSeal to be used for contouring. Additional roller use may be required to remove entrapped air. Refer to Attachment 3 for further explanation.
10. CORE Liner® must not be overheated from the installation of the external coating. CORE Liner® has a polyethylene liner inside the pipeline. Damage/failure of the liner could occur as a result of overheating. Liner damage/failure is not visible from the outside of the pipeline. Overheat scenarios could require costly repairs.
11. The temperature of the entire surface to be coated shall be measured using a ***calibrated digital surface contact thermometer***. The surface temperature must be measured frequently (every 30 seconds for heating using a torch) to promptly detect when the required temperature is reached. When measuring the temperature, allow the digital surface contact thermometer to touch the surface for at least three seconds (and until the temperature reading stabilizes) before taking the temperature reading.
12. The installer shall uniformly heat the entire circumference of the center band of the application area to a target surface temperature of **100°C**. The installer shall measure the temperature in a manner that verifies that the maximum allowable surface temperature of **130°C** is not exceeded anywhere.
13. The installer shall uniformly heat the entire circumference at the edges of the application area (the abraded mainline coating) to achieve, or exceed, the minimum surface temperature specified in the MQAP. The installer shall measure the temperature in a manner that verifies that the maximum allowable surface temperature of **130°C** is not exceeded anywhere.
14. The installer shall stop the pre-heating process as soon as the entire application area reaches the minimum surface temperature specified in the MQAP.
15. Where heating ovens are used, all the elements of a heating oven must be functioning to avoid localized overheating.
16. Contact your CORE Linepipe® foreman for any questions or clarifications.

17. All the personnel involved in applying external coatings on CORE Linepipe® products must sign the Sign-Off and Acknowledgement of CORE Linepipe® External Coating Requirements sheet. Refer to Attachment 4.
18. The CORE Liner® pipe should never be heated to a surface temperature greater than **130°C**. If this temperature is ever exceeded, you must contact a CORE Linepipe® representative immediately. The joint will be inspected and the damaged section will be replaced.



WARNING

WHEN APPLYING SHRINK SLEEVES DO NOT OVERHEAT THE PIPE.
OVERHEATING WILL DAMAGE THE PLASTIC LINER.

- DO NOT EXCEED **130°C SURFACE TEMPERATURE** AT ANY TIME DURING SLEEVING.
- SHRINK SLEEVES TO ONLY BE APPLIED BY TECHNICIANS WITH A VALID CANUSA TICKET.
- REFER TO CORE LINEPIPE® SHRINK SLEEVE BULLETIN.
- CONTACT CORE LINEPIPE® FOREMAN FOR PROJECT SPECIFIC INSTRUCTIONS.

19. The warning sticker (shown above) is to be removed from on the pipe after the external coating is applied and prior to jacking.

Attachment 1.

Completed ClickWeld® - Ready to Sleeve



Check for ALL of the following Prior to Sleeving:

1. Both Plugs are installed
2. EF # is written
3. OK and initials are present

There is only one acceptable scenario that indicates a ClickWeld® joint is ready to be sleeved. The above image shows the requirement of the EF #, two installed plugs, and an ok with initials.

If any of these three are missing, DO NOT SLEEVE.

Contact a CORE Service® team member before moving forward.

Incomplete ClickWeld® – DO NOT SLEEVE

Scenario 1: No Plugs



Even if there is an EF # and an OK and initial, if both plugs are not installed, there should not be a sleeve.

DO NOT SLEEVE IF A PLUG IS MISSING!

Scenario 2: No EF



Even if there is an OK and initial and both plugs are installed, if there is no EF #, there should not be a sleeve.

DO NOT SLEEVE IF "EF #" IS MISSING!

Incomplete ClickWeld® – DO NOT SLEEVE

Scenario 3: No OK & Initial



Even if both plugs are installed and there is an EF #, if there is no OK and initial, there should not be a sleeve.

DO NOT SLEEVE IF "OK & INITIAL" IS MISSING!



CORE LINEPIPE

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Attachment 2.

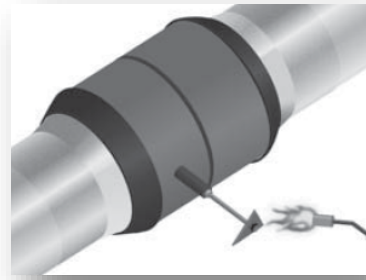
External Coating QC Data Entry Form

Company	Name	Position	Ticket #	Date	Signature
EF #/Serial #	Product	Surface Temperatures (Min & Max)		Installer Initials	

Attachment 3.

ClickWeld® Joint Contouring

Mastic filler/AquaSeal is required on both sides of the CORE Linepipe® ClickWeld® joint. Wrap around both sides of the joint. Using a heated scraper, form the mastic so it creates a 30° to 45° bevel transition. The mastic filler can be heated by torch to soften and allow better forming.



Please contact your CORE Service® foreman for any questions.

Attachment 4.

Sign-Off and Acknowledgement of CORE Linepipe® External Coating Requirements

Name	Position	Ticket #	Product	Date	Signature



MANUFACTURER'S QUALIFIED APPLICATION PROCEDURE (MQAP)

Revision 1.0

1. Product Description

The MS1F is supplied in 25 mm x 300 mm (1" by 12") Melt Sticks. The MS1F is approved to repair damage in the above mainline coatings with exposed metal up to 12mm (1/2") in diameter.

Compatible with the following mainline coating systems:

- CSA Z245.21 System A
- CSA Z245.21 System B1
- CSA Z245.21 System B2

2. Storage & Safety Guidelines

To ensure maximum performance, store Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. If the product must be removed from its original packaging then the new packaging must provide the same level of protection as the original. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F) for the melt stick. Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (41°F) for the epoxy kit(s). Prior to installation the melt sticks and epoxy should be at or near room temperature 20°C ±3. Product installation should be done in accordance with local health and safety regulations.

3. Equipment List

Appropriately sized torch, propane tank, hose & regulator or standard "plumbers torch", knife, approved solvent, clean rags, 80 – 120 grit sand paper / coarse emery cloth (resin bonded preferred), grinder with a medium grit disc and standard safety equipment (leather gloves, impermeable gloves, safety glasses, hard hat, etc.)

Approved Solvents:

- Acetone
- MEK
- Denatured Alcohol ≥95%
- Isopropanol ≥95%
- Any solvent that flashes off 100% without leaving a residue

4. Flame Intensity & Torch Size

A standard "plumbers" torch can be used for this installation.

If using a torch that is normally used for sleeve installations use a torch with less than 150,000Btu.

The torch size may also differ depending on ambient conditions and expected production rates. The use of an improperly sized torch may cause damage to the field joint or mainline coating during installation.

5. Surface Preparation - All Damage

When identifying damage ahead of repairing use a paint pen to mark at least 50mm beyond the damaged areas on all sides. If repairing immediately after discovery marking is not necessary.

1. Remove all foreign contaminants such as ice, frost snow, mud, dirt, cement dust.
2. Scrap off all paint marker, magic marker, paint stick.
3. Trim off any damaged mainline coating due to previous construction steps.
4. Clean exposed steel and adjacent pipe coating with an approved solvent to remove the presence of oil, grease, and other contaminants if present. Ensure that the pipe is dry prior to mechanical cleaning.

This step shall be done anywhere the product will make contact with the pipe (steel and mainline coating).

6. Surface Preparation - Minor Damage

Using the sandpaper, abrade the mainline coating in the repair area. Remove all oxidation (shine) under area of the patch. The steel surface shall be cleaned using a hand or power wire brush to a minimum ISO St 3 / SSPC SP3 finish prior to coating application.

After surface preparation, wipe clean using a lint-free cloth or air blast the steel surface and pipe coating to remove foreign contaminants. In very dry ambient conditions a dry lint free rag may not remove the fine dust being held onto the pipe with static. In this case a little solvent on the rag will help clean the surface.

7. Surface Preparation - Major Damage

Using a knife carefully cut out only the damaged coating into a smooth sided shape.

After surface preparation, wipe clean using a lint-free cloth or air blast the steel surface and pipe coating to remove foreign contaminants. In very dry ambient conditions a dry lint free rag may not remove the fine dust being held onto the pipe with static. In this case a little solvent on the rag will help clean the surface.



8. Preheat to application temperature

Use a low intensity yellow flame for preheating the coating and applying the repair products. With quick back and forth strokes, pre-heat the repair zone sufficiently to remove moisture and assist in adhesion.

CAUTION:

Do not hold propane torch on one spot, but keep moving over the repair area. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat the curled section must be removed.

9. Melt Stick Application

Touch the Melt Stick to the pipe surface. If it melts or leaves a mark then the preheat temperature has been reached and you can continue with the application. If not mark is generated continue to preheat the pipe and check again. Heat the melt stick with the torch until the outermost layer becomes fluid.

10. Melt Stick Application

Heat the melt stick and the repair zone simultaneously with the torch and spread the melt stick over the damaged area. The torch must remain moving to prevent damage to the coating. Some ignition of the melt stick is acceptable but try to limit the ignition time by removing the flame as necessary.

11. Melt Stick Application

Continue spreading the melt stick over the holiday and the adjacent mainline coating until the entire area is covered. The area to cover is the holiday plus 25mm (1") all around the holiday. After sufficient melt stick material is on the surface, apply additional heat in quick back-and-forth strokes to create a smooth surface.

12. Applied Melt Stick Inspection

Visually and physically inspect the installed melt stick to ensure that:

- Proper overlap onto the mainline coating. $\geq 25\text{mm}$ (1")
- No entrapped air
- Ensure that the melt stick material completely covers the repair zone.
- The melt stick material should be spread liberally so that the material is raised above the coating surface.

Backfilling/Laying Guidelines

After application is complete, allow the repair patch to cool before pipe handling. For onshore applications, prevent damage to the melt stick repair by backfilling with select backfill or material with no sharp stones or large particles. Alternately, protect the repair patch with extruded polyethylene mesh or other suitable protective shield as approved by the Manufacturer. Allow the melt stick to cool to less than 50°C prior to laying, repair patch can be water quenched. For offshore if the field joint is to be infilled, then water quenching is unnecessary.

DISCLAIMER:

Always check with the mainline coating manufacturer for proper repair procedure prior to beginning repair work.

Storage & Safety Guidelines

To ensure maximum performance, store Shawcor's Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F). Product installation should be done in accordance with local health and safety regulations.

These installation instructions are intended as a guide for standard products. Consult your Canusa representative for specific projects or unique applications.

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Canusa-CPS is registered to ISO 9001:2008

Canusa warrants that the product conforms to its chemical and physical description and is appropriate for the use stated on the installation guide when used in compliance with Canusa's written instructions. Since many installation factors are beyond our control, the user shall determine the suitability of the products for the intended use and assume all risks and liabilities in connection therewith. Canusa's liability is stated in the standard terms and conditions of sale. Canusa makes no other warranty either expressed or implied. All information contained in this installation guide is to be used as a guide and is subject to change without notice. This installation guide supersedes all previous installation guides on this product. E&OE

**MANUFACTURER'S QUALIFIED APPLICATION PROCEDURE (MQAP)**

Revision 1.0

1. Product Description

The Coating Repair Patch Type 'O' (CRPO) is supplied in 150 mm x 150 mm patches or in rolls 150 mm wide by 15 m long that can be field cut-to-size.

Compatible with the following mainline coating systems:

- CSA Z245.20 System 1A
- CSA Z245.20 System 2A
- CSA Z245.20 System 2B
- CSA Z245.21 System A
- CSA Z245.21 System B1
- CSA Z245.22
- CSA Z245.30 System FC4

2. Storage & Safety Guidelines

To ensure maximum performance, store Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. If the product must be removed from its original packaging then the new packaging must provide the same level of protection as the original. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F) for the repair patches. Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (41°F) for the epoxy kit(s). Prior to installation the repair patch and the epoxy should be at or near room temperature 20°C ±3. Product installation should be done in accordance with local health and safety regulations.

3. Equipment List

Appropriately sized torch, propane tank, hose & regulator, digital surface contact thermometer, roller, knife, approved solvent, J roller, clean rags, 80 – 120 grit sand paper / coarse emery cloth (resin bonded preferred), grinder with a medium grit disc and standard safety equipment (leather gloves, impermeable gloves, safety glasses, hard hat, etc.).

Approved Solvents:

- Acetone
- MEK
- Denatured Alcohol ≥95%
- Isopropanol ≥95%
- Any solvent that flashes off 100% without leaving a residue

4. Flame Intensity & Torch Size

Minimum Torch Size: 150,000 Btu

The torch size may also differ depending on ambient conditions and expected production rates. The use of an improperly sized torch may cause damage to the field joint or mainline coating during installation.

5. Repair Analysis

The type of repair is dependent on the extent of the damage to the mainline coating. If the damage extends to the bare steel it shall be considered major and step 9 shall be followed for surface preparation. If only the PE backing is affected and there is no damage to the anti-corrosion coating, the damage shall be considered minor and step 8 shall be followed.

6. Surface Preparation - All Damage

Using a marker, mark a rectangle 50mm beyond the damaged areas on all sides.

1. Remove all foreign contaminants such as ice, frost snow, mud, dirt, cement dust.
2. Scrap off all paint marker, magic marker, and paint stick.
3. Trim off any damaged mainline coating due to previous construction steps.
4. Clean exposed steel and adjacent pipe coating with an approved solvent to remove the presence of oil, grease, and other contaminants if present. Ensure that the pipe is dry prior to mechanical cleaning.

This step shall be done anywhere the product will make contact with the pipe (steel and mainline coating).

7. Repair Patch Measurement

Measure the dimensions required for the Repair Patch. Cut the Repair Patch to the appropriate size to cover the patch area, with a minimum 50mm overlap from any point of the damage. Cut the 4 corners off the patch to avoid lifting of the corners.

8. Surface Preparation - Minor Damage

Using the sandpaper, abrade the mainline coating in the repair area. Remove all oxidation (shine) under area of the patch. The steel surface shall be cleaned using a hand or power wire brush to a minimum ISO St 3 / SSPC SP3 finish prior to coating application.

After surface preparation, wipe clean using a lint-free cloth or air blast the steel surface and pipe coating to remove foreign contaminants. In very dry ambient conditions a dry lint free rag may not remove the fine dust being held onto the pipe with static. In this case a little solvent on the rag will help clean the surface.

**9. Surface Preparation - Major Damage**

Using a knife, carefully cut out only the damaged coating into a smooth sided shape.

When repairing insulated pipe mainline coating also inspect the urethane foam. If the foam is damaged too much you may have to remove the damaged foam and repair according to the mainline coating manufacturer's recommendations.

10. Preheat to application temperature

Preheat the epoxy and the abraded mainline coating to be covered by the repair patch to a minimum of 75°C (167°F) with the appropriate propane torch, induction heating or infrared heating equipment. Ensure the correct temperature has been reached using a digital surface contact thermometer. When using an induction coil to preheat once the correct temperature has been reached on the steel you must heat the mainline coating with the appropriately sized propane torch. When installing over a PE mainline coating even if the preheat temperature has been reached you must heat the surface of the PE mainline coating with a propane torch to oxide the surface to enhance adhesion. The thicker the mainline coating the greater the difference between the bare steel and surface temperature of the mainline coating. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat step.

CAUTION:

Do not hold propane torch on one spot, but keep moving over the repair area. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat the curled section must be removed.

11. Heating of Repair Patch

While holding the Repair Patch with a pair of pliers, use the propane torch to heat the black backing until the Repair Patch becomes soft and flexible.

12. Applying the Repair Patch

As the Repair Patch is laid on the pipe, place torch between Repair Patch Adhesive & pipe surface. Continue heating area as the Repair Patch is applied.

13. Post heating Repair Patch

Using the roller and propane torch, continue heating and rolling from the middle to each edge. Continue until the adhesive is fully molten and has wet out on all edges.

CAUTION: Too much heat in one spot can damage mainline coating. Keep the torch moving at all times.

14. Installed Repair Patch Inspection

Visually and physically inspect the installed repair patch to ensure that:

- Repair Patch is in full contact with the pipe.
- No cracks or holes in Repair Patch backing
- Proper overlap onto the mainline coating. ≥50mm (2")
- No entrapped air
- No large wrinkles

If there is any damage to the CRPO patch it shall be removed and a new patch is to be installed.

Backfilling/Laying Guidelines

After shrinking is complete, allow the repair patch to cool before pipe handling. For onshore applications, prevent damage to the repair patch by backfilling with select backfill or material with no sharp stones or large particles. Alternately, protect the repair patch with extruded polyethylene mesh or other suitable protective shield as approved by the Manufacturer. Allow the repair patch to cool to less than 50°C prior to laying, repair patch can be water quenched. For offshore If the field joint is to be infilled, then water quenching is unnecessary.

DISCLAIMER:

Always check with the mainline coating manufacturer for proper repair procedure prior to beginning repair work.

Storage & Safety Guidelines

To ensure maximum performance, store Shawcor's Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F). Product installation should be done in accordance with local health and safety regulations.

These installation instructions are intended as a guide for standard products. Consult your Canusa representative for specific projects or unique applications.

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**MANUFACTURER'S QUALIFIED APPLICATION PROCEDURE (MQAP)**

Revision 1.01

1. Product Description

K-60 Wrapid Sleeves™ are shipped pre-cut with a pre-attached CLW closure. K-60 bulk rolls are shipped as a roll and can be cut to size in the field. Closure seals will be separate from the bulk roll and may need to be cut to the width of the sleeve. The sleeve adhesive is protected from contamination by an inner liner.

Compatible with the following mainline coating systems:

- CSA Z245.20 System 1A
- CSA Z245.20 System 2A
- CSA Z245.20 System 2B
- CSA Z245.21 System A
- CSA Z245.21 System B1
- CSA Z245.22

2. Storage & Safety Guidelines

To ensure maximum performance, store Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. If the product must be removed from its original packaging then the new packaging must provide the same level of protection as the original. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F) for the sleeves. Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (41°F) for the epoxy kit(s). Prior to installation the sleeves and the epoxy should be at or near room temperature 20°C ±3. Product installation should be done in accordance with local health and safety regulations.

3. Equipment List

Appropriately sized torch, propane tank, hose and regulator, appropriate tools for surface abrasion, buffing wheel or wire brush, knife, J roller, 80 grit sand paper, rags and approved solvent, digital contact thermometer with suitable probe and standard safety equipment (leather and rubber gloves, goggles, hard hat, etc.)

Approved Solvents:

- Acetone
- MEK
- Denatured Alcohol ≥95%
- Isopropanol ≥95%
- Any solvent that flashes off 100 % without leaving a residue

4. Flame intensity and torch size

Pipe O.D. <450mm (18")

Minimum Torch Size: 150,000 Btu

Pipe O.D. > 450mm (18")

Minimum Torch Size: 300,000 Btu

The torch size may also differ depending on ambient conditions and expected production rates. The use of an improperly sized torch may cause damage to the sleeve or mainline coating during installation. The use of induction or infrared heating equipment is recommended for pipe sizes greater than 760mm (30") O.D.

5. Surface Preparation

1. Remove all foreign contaminants such as ice, frost snow, mud, dirt, cement dust.
2. Scrap off all paint marker, magic marker, and paint stick.
3. Trim off any damaged mainline coating due to previous construction steps.
4. Clean exposed steel and adjacent pipe coating with an approved solvent to remove the presence of oil, grease, and other contaminants if present. Ensure that the pipe is dry prior to mechanical cleaning.

This step shall be done anywhere the product will make contact with the pipe (steel and mainline coating).

6. Surface Preparation

Ensure that the pipe is at least 3°C (5°F) above the dew point prior to surface preparation. The steel surface shall be cleaned using a hand or power wire brush to a minimum ISO St 3 / SSPC SP3 finish prior to coating application.

Optional:

The steel surface shall be cleaned with a dry abrasive blasting to ISO Sa 2.5/ SSPC SP10/ NACE 2. Be careful not to direct the blasting nozzle at the mainline coating if it is CSA Z245.21 System A as it may cause the PE jacket to lift. If the PE jacket has lifted then you must remove the lifted section prior to continuing to the next step.

Factory coating edges should be abraded for a minimum width of 50mm (2") beyond the edge of where the sleeve will be installed using the 80 grit sandpaper or coarse emery cloth paper or a grinder with a 40-60 grit flap wheel disc and should be beveled to 30° to eliminate the vertical edge for FBE, Dual Powder or Liquid Epoxy. Thin PE mainline coatings shall only be abraded with the 80 grit sandpaper. After cleaning, wipe clean or air blast the steel surface and pipe coating to remove foreign contaminants.

**7A. Pre-Heat (torch)**

Pre-heat the cutback area and abraded coating to the minimum required temperature of 65°C with the appropriately sized propane torch. Ensure the correct temperature has been reached using a digital surface contact thermometer. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat the curled section must be removed.

Dry abrasive blasted steel may flash rust when exposed to open flame when it is below 40°C. There are two ways to avoid flash rust:

1. Preheat the pipe prior to dry abrasive blasting such that after surface preparation is completed the pipe remains over 40°C
2. Dry abrasive blast the steel cold, then heat it up high enough that when you do a quick brush blast the pipe remains over 40°C

In cold and/or windy conditions you will have to raise the preheat temperature so that the pipe remains above the application long enough to install the sleeve. If you cannot raise the temperature high enough without damaging the mainline coating then you will have to change the application environment by using hoarding or shelters.

7B. Pre-Heat (Infrared Heater)

Pre-heat the cutback area and abraded coating to the minimum required temperature of 65°C with the appropriately sized infrared heater. Adjust the propane pressure so that the steel and the mainline coating reach the required temperature at the same time without damaging the mainline coating. Ensure the correct temperature has been reached using a digital surface contact thermometer. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat the curled section must be removed.

7C. Pre Heat (Induction Coil)

Pre-heat the cutback area and abraded coating to the minimum required temperature of 65°C with the appropriately sized induction coil. Ensure the correct temperature has been reached using a digital surface contact thermometer. Once the correct temperature has been reached on the steel you must heat the mainline coating with the appropriately sized propane torch. When installing over a PE mainline coating even if the preheat temperature has been reached you must heat the surface of the PE mainline coating with a propane torch to oxide the surface to enhance adhesion. The thicker the mainline coating the greater the difference between the bare steel and surface temperature of the mainline coating. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat step. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat it the curled section must be removed.

8. Sleeve Installation

Partially remove the release liner and gently heat the underlap approximately 150 mm (6") from the edge. Centre the sleeve over the joint so that the sleeve overlaps between the 10 and 2 o'clock positions. With the minimum overlap onto the mainline coating. The minimum overlap onto existing coating shall be 2" after installation; greater overlap is required prior to installation as the sleeve will neck in after shrinking. Press the underlap firmly into place.

9. Sleeve Installation

Wrap the sleeve loosely around the pipe, ensuring the appropriate overlap. Lift the overlap so that the underlap is exposed all except for about 12mm (1/2") and gently heat the backing of the underlap until it just starts to recover. Lightly heat the adhesive side of the overlap until it is glossy and firmly press it down onto the underlap.

10. Sleeve Installation

For "Wrapid Sleeves" with pre attached closure seals

Fold the closure seal back on itself and using the propane torch heat the underside of the closure seal until it starts to soften. Press the closure firmly into place. Gently heat the top of the closure and pat it down with a gloved hand. If the sleeve has the clear CLW closure the closure will go from opaque to clear when it is hot enough. Repeating this procedure, move from one side to the other. Smooth any wrinkles by gently working them outward from the center of the closure with a roller.

For "CanusaWrap" bulk roll

Select the correct closure for the sleeve installation as follows:

CLW - remove the liner from the closure seal and expose the adhesive strips on the closure seal, center the closure seal on the overlapping sleeve and press down firmly.

CLS - remove the liner and heat the underside of the closure seal, center the closure seal on the overlapping sleeve and press down firmly with a gloved hand.

CLH - heat the underside of the closure seal, center the closure seal on the overlapping sleeve and press down firmly with a gloved hand.

Roll out any entrapped air in the closure seal with a roller.

11. Sleeve Installation

Using the appropriate sized torch, begin at the center of the sleeve and heat circumferentially around the pipe using broad strokes. If utilizing two torches, operators should work on opposite sides of pipe and be careful not to have both torches aimed at one spot at the same time.

Pipe O.D.

<450mm (18") 1 torch

>450mm (18") 2 torches

If using an infrared heater to shrink the sleeve place it centered over the sleeve and leave it in position until the requirements of Step 12 have been met.

**12. Sleeve Installation**

Continue heating from the center toward one end of the sleeve until recovery is complete. In a similar manner, heat and shrink the remaining side. Shrinking has been completed when the adhesive begins to ooze at the sleeve edges all around the circumference. Finish shrinking the sleeve with long horizontal strokes over the entire surface to ensure a uniform bond.

13. Sleeve Installation

While the sleeve is still hot and soft, use a hand roller to gently roll the sleeve surface and push any trapped air up and out of the sleeve, as shown above. Focus on the areas where there is a change in height, both sides of the weld and the cutback edges. Press hard enough to move a little of the adhesive but all of the air. Pressing too hard may cause the sleeve to wrinkle and may cause excess adhesive to be removed from the sleeve. Roll the sleeve from the bottom towards the overlap/underlap seam. Once all the entrapped air is gathered in the underlap/overlap seam roll from the weld out towards the edge of the sleeve in a "v" motion. Continue the procedure by also firmly rolling the closure with long horizontal strokes from the weld outwards. If the sleeve becomes too stiff to roll it may be gently reheated with the torch. Also if the sleeve wrinkles the wrinkle may be removed with gentle heating and rolling.

14. Installed Sleeve Inspection

Visually and physically inspect the installed sleeve to ensure that:

- Sleeve is in full contact with the steel joint
- Adhesive flows beyond all sleeves edges
- No cracks or holes in sleeve backing
- Proper overlap onto the mainline coating $\geq 50\text{mm}$ (2")
- No entrapped air
- No large wrinkles

Repairs

The K-60 sleeve shall be repaired using approved products. CRPO is for repairing damage from a pinhole up to 50mm (2") in diameter. A partial sleeve wrapped fully around the pipe can be used to repair damage larger than 50mm (2") and shall have at least 50mm (2") of overlap onto undamaged coating when fully installed. A full sleeve can be cut down in width from its original width. The smallest width allowed is 150mm (6"). Larger repairs can be made using a sleeve cut down to a maximum of 300mm (12"). If the damage to be repaired is larger than this can cover then you must do a full sleeve removal and reapplication of a new sleeve.

Note: Small repairs when heated to the repair products application temperature may cause the damage to increase in size.

See the appropriate MQAP for the above products for correct installation.

Backfilling/Laying Guidelines

After shrinking is complete, allow the sleeve to cool before pipe handling. For onshore applications, prevent damage to the sleeve by backfilling with select backfill or material with no sharp stones or large particles. Alternately, protect the sleeve with extruded polyethylene mesh or other suitable protective shield as approved by the Manufacturer. Allow the sleeve to cool to less than 40°C prior to laying, sleeve can be water quenched. For offshore if the field joint is to be infilled, water quenching is unnecessary.

Storage & Safety Guidelines

To ensure maximum performance, store Shawcor's Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F). Product installation should be done in accordance with local health and safety regulations.

These installation instructions are intended as a guide for standard products. Consult your Canusa representative for specific projects or unique applications.

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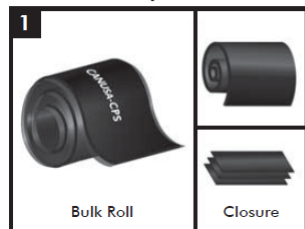
Canusa-CPS is registered to ISO 9001:2008

Canusa warrants that the product conforms to its chemical and physical description and is appropriate for the use stated on the installation guide when used in compliance with Canusa's written instructions. Since many installation factors are beyond our control, the user shall determine the suitability of the products for the intended use and assume all risks and liabilities in connection therewith. Canusa's liability is stated in the standard terms and conditions of sale. Canusa makes no other warranty either expressed or implied. All information contained in this installation guide is to be used as a guide and is subject to change without notice. This installation guide supersedes all previous installation guides on this product. E&OE



Appendix I – Sleeve Cutting Guideline for Sleeves Supplied in Bulk

Product Description



For bulk supply of material, the Heat Shrinkable Sleeve will be in a larger roll, with the adhesive being protected from contamination by an inner liner. Closures are shipped either in Bulk rolls or Pre-cut.

Equipment List



Knife, tape measure; standard safety equipment; gloves and goggles

Product Preparation Guidelines

3	Bulk Roll: Recommended Cutting Method	Closure
<p>Overlap</p> <p>Pipe O.D.: ≤ 450 mm (18") 100 mm overlap > 450 mm (18") 150 mm overlap</p>	<p>Underlap Cut Sleeve Overlap</p> <p>Corner Cuts</p> <p>< 450mm Pipe O.D. A-50mm, B-25mm</p> <p>≥ 450mm Pipe O.D. A-100mm, B-50mm</p> <p>W Sleeve Width</p> <p>Closure</p>	

See below for the guideline for sleeve layflat length, based on standard pipe diameters. For special diameters not mentioned, cut the required lengths of sleeve material (L) and Closure Material (W) from the bulk rolls as follows:

L = Coated Pipe Circumference + overlap dimension + 50 mm

W = Sleeve Width

Ensure that the sleeve and closure are not damaged or contaminated. Trim corners as shown.



Appendix II - Layflat Lengths and Recommended Closure Widths

Canusa-CPS Sleeve Size (mm)	Nominal Pipe Size (NPS)	Actual Pipe Size OD		Cut Length		Minimum Closure Size/Overlap
		(in)	(mm)	Sleeve Length (mm)	Sleeve Length (ft)	Width of Closure (mm) \pm 3 mm Overlap on sleeve/off sleeve \pm 10 mm
55	2.0	2.375	60.3	280	0.919	100mm - 50mm/50mm
63	2.5	2.875	73.0	300	0.984	100mm - 50mm/50mm
90	3.0	3.500	88.9	355	1.165	100mm - 50mm/50mm
110	3.5	4.000	101.6	415	1.362	100mm - 50mm/50mm
115	4.0	4.500	114.3	460	1.509	100mm - 50mm/50mm
125	4.5	5.000	127.0	545	1.788	100mm - 50mm/50mm
140	5.0	5.563	141.3	590	1.936	100mm - 50mm/50mm
170	6.0	6.625	168.3	670	2.198	100mm - 50mm/50mm
230	8.0	8.625	219.1	835	2.740	100mm - 50mm/50mm
280	10.0	10.750	273.1	1030	3.379	100mm - 50mm/50mm
315	12.0	12.750	323.9	1195	3.921	100mm - 50mm/50mm
350	14.0	14.000	355.6	1305	4.281	100mm - 50mm/50mm
400	16.0	16.000	406.4	1475	4.839	100mm - 50mm/50mm
430	17.0	17.000	431.8	1560	5.118	100mm - 50mm/50mm
450	18.0	18.000	457.2	1645	5.397	100mm - 50mm/50mm
500	20.0	20.000	508.0	1820	6.091	100mm - 50mm/50mm
560	22.0	22.000	558.8	1990	6.659	100mm - 50mm/50mm
610	24.0	24.000	609.6	2160	7.228	100mm - 50mm/50mm
660	26.0	26.000	660.4	2330	7.797	100mm - 50mm/50mm
710	28.0	28.000	711.2	2455	8.216	100mm - 50mm/50mm
760	30.0	30.000	762.0	2675	8.952	100mm - 50mm/50mm
810	32.0	32.000	812.8	2835	9.487	100mm - 50mm/50mm
860	34.0	34.000	863.6	3000	10.039	100mm - 50mm/50mm
915	36.0	36.000	914.4	3170	10.608	150mm - 75mm/75mm
960	38.0	38.000	965.2	3335	11.270	150mm - 75mm/75mm
1015	40.0	40.000	1016.0	3510	11.861	150mm - 75mm/75mm
1060	42.0	42.000	1066.8	3680	12.436	150mm - 75mm/75mm
1120	44.0	44.000	1117.6	3850	13.010	150mm - 75mm/75mm
1170	46.0	46.000	1168.4	4020	13.585	150mm - 75mm/75mm
1220	48.0	48.000	1219.2	4195	14.176	150mm - 75mm/75mm
1270	50.0	50.000	1270.0	4240	14.328	150mm - 75mm/75mm
1320	52.0	52.000	1320.8	4400	14.869	150mm - 75mm/75mm
1370	54.0	54.000	1371.6	4560	15.409	150mm - 75mm/75mm
1420	56.0	56.000	1422.4	4720	15.950	150mm - 75mm/75mm
1470	58.0	58.000	1473.2	4875	16.474	150mm - 75mm/75mm
1520	60.0	60.000	1524.0	5035	17.015	150mm - 75mm/75mm
1620	64.0	64.000	1625.6	5325	17.995	150mm - 75mm/75mm
1720	68.0	68.000	1727.2	5640	19.059	150mm - 75mm/75mm

**MANUFACTURER'S QUALIFIED APPLICATION PROCEDURE (MQAP)**

Revision 1.01

1. Product Description

Canusa's Directional Drilling Kits - TBK systems are composed of two sleeves (main sleeve and sacrificial sleeve) and epoxy kit(s). The epoxy kit(s) includes: application accessories, latex gloves and pre-measured quantities of Canusa Epoxy Primer. The sleeve adhesive is protected from contamination by an inner liner.

Compatible with the following mainline coating systems:

- CSA Z245.20 System 1A
- CSA Z245.20 System 2A
- CSA Z245.20 System 2B
- CSA Z245.21 System A
- CSA Z245.21 System B1
- CSA Z245.22

2. Storage & Safety Guidelines

To ensure maximum performance, store Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. If the product must be removed from its original packaging then the new packaging must provide the same level of protection as the original. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F) for the sleeves. Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (41°F) for the epoxy kit(s). Prior to installation the sleeves and the epoxy should be at or near room temperature 20°C ±3. Product installation should be done in accordance with local health and safety regulations.

3. Equipment List

Appropriately sized torch, propane tank, hose & regulator, digital surface contact thermometer, roller, knife, dry abrasive blasting pot, appropriate abrasive media, approved solvent, J roller, clean rags, 80 grit sand paper / coarse emery cloth (resin bonded preferred) and standard safety equipment (leather gloves, impermeable gloves, safety glasses, hard hat, etc.).

Approved Solvents:

- Acetone
- MEK
- Denatured Alcohol ≥95%
- Isopropanol ≥95%
- Any solvent that flashes off 100% without leaving a residue

4. Flame intensity and torch size

Pipe O.D. <450mm (18")

Minimum Torch Size: 150,000 Btu

Pipe O.D. > 450mm (18")

Minimum Torch Size: 300,000 Btu

The torch size may also differ depending on ambient conditions and expected production rates. The use of an improperly sized torch may cause damage to the sleeve or mainline coating during installation. The use of induction or infrared heating equipment is recommended for pipe sizes greater than 760mm (30") O.D.

5. Surface Preparation

1. Remove all foreign contaminants such as ice, frost snow, mud, dirt, cement dust.
2. Scrap off all paint marker, magic marker, and paint stick.
3. Trim off any damaged mainline coating due to previous construction steps.
4. Clean exposed steel and adjacent pipe coating with an approved solvent to remove the presence of oil, grease, and other contaminants if present. Ensure that the pipe is dry prior to mechanical cleaning.

This step shall be done anywhere the product will make contact with the pipe (steel and mainline coating).

6. Surface Preparation

Ensure that the pipe is at least 3°C (5°F) above the dew point prior to surface preparation. The steel surface shall be cleaned using a hand or power wire brush to a minimum ISO St 3 / SSPC SP3 finish prior to coating application.

Optional:

The steel surface may be cleaned with a dry abrasive blasting to ISO Sa 2.5/ SSPC SP10/ NACE 2. Be careful not to direct the blasting nozzle at the mainline coating if it is CSA Z245.21 System A as it may cause the PE jacket to lift. If the PE jacket has lifted then you must remove the lifted section prior to continuing to the next step.

Factory coating edges should be abraded for a minimum width of 50mm (2") beyond the edge of where the sleeve will be installed using the 80 grit sandpaper or coarse emery cloth paper or a grinder with a 40-60 grit flap wheel disc and should be beveled to 30° to eliminate the vertical edge for FBE, Dual Powder or Liquid Epoxy. Thin PE mainline coatings shall only be abraded with the 80 grit sandpaper. After cleaning, wipe clean or air blast the steel surface and pipe coating to remove foreign contaminants.

**7A. Preheat to application temperature (Propane Torch)**

Pre-heat the cutback area and abraded coating to the minimum required temperature of 75°C with the appropriately sized propane torch. Ensure the correct temperature has been reached using a digital surface contact thermometer. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat. For insulated mainline coatings covered under CSA Z245.22 you shall only preheat the PE jacket, do not try to preheat the exposed insulation itself as it may start on fire. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat the curled section must be removed.

Dry abrasive blasted steel may flash rust when exposed to open flame when it is below 40°C. There are two ways to avoid flash rust:

1. Preheat the pipe prior to dry abrasive blasting such that after surface preparation is completed the pipe remains over 40°C
2. Dry abrasive blast the steel cold, then heat it up high enough that when you do a quick brush blast the pipe remains over 40°C

If neither of these methods work then an alternative dry heat source such as the infrared heater or induction coil shall be used.

7B. Preheat to application temperature (Infrared Heater)

Pre-heat the cutback area and abraded coating to the minimum required temperature of 75°C with the appropriately sized infrared heater. Adjust the propane pressure so that the steel and the mainline coating reach the required temperature at the same time without damaging the mainline coating. Ensure the correct temperature has been reached using a digital surface contact thermometer. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat it the curled section must be removed.

7C. Pre Heat (Induction Coil)

Pre-heat the cutback area and abraded coating to the minimum required temperature of 75°C with the appropriately sized induction coil. Ensure the correct temperature has been reached using a digital surface contact thermometer. Once the correct temperature has been reached on the steel you must heat the mainline coating with the appropriately sized propane torch. When installing over a PE mainline coating even if the preheat temperature has been reached you must heat the surface of the PE mainline coating with a propane torch to oxide the surface to enhance adhesion. The thicker the mainline coating the greater the difference between the bare steel and surface temperature of the mainline coating. The preheat temperature must exceed the minimum required temperature but the mainline coating must not be damaged during preheat step. If a film develops on the mainline coating because of preheat, use a surface abrasion tool to remove it. If the mainline coating lifts or curls during preheat it the curled section must be removed.

8. Primary Sleeve Installation

Using the wider sleeve, partially remove the release liner and gently heat the adhesive side of the underlap approximately 150mm (6") from the edge. Centre the sleeve over the joint so that the sleeve overlaps between the 10 and 2 o'clock positions. With the minimum overlap onto the mainline coating. The minimum overlap onto existing coating shall be 2" after installation; greater overlap is required prior to installation as the sleeve will neck in after shrinking. Press the underlap firmly into place.

9. Primary Sleeve Installation

Wrap the sleeve loosely around the pipe, ensuring the appropriate overlap. Lift the overlap so that the underlap is exposed all except for about 12mm (1/2") and gently heat the backing of the underlap until it just starts to recover. Lightly heat the adhesive side of the overlap until it is glossy and firmly press it down onto the underlap.

10. Primary Sleeve Installation

Fold the closure seal back on itself and using the propane torch heat the underside of the closure seal until it starts to soften. Press the closure firmly into place. Gently heat the top of the closure and pat it down with a gloved hand. Repeating this procedure, move from one side to the other. Smooth any wrinkles by gently working them outward from the center of the closure with a roller.

11. Primary Sleeve Installation

Using the appropriate sized torch, begin at the center of the sleeve and heat circumferentially around the pipe. Use broad strokes. If utilizing two torches, operators should work on opposite sides of pipe and be careful not to have both torches aimed at one spot at the same time.

Pipe O.D.

<450mm (18") 1 torch

>450mm (18") 2 torches

If using an infrared heater to shrink the sleeve place it centered over the sleeve and leave it in position until the requirements of Step 12 have been met.

12. Primary Sleeve Installation

Continue heating from the center toward one end of the sleeve until recovery is complete. In a similar manner, heat and shrink the remaining side. Shrinking has been completed when the adhesive begins to ooze at the sleeve edges all around the circumference. Finish shrinking the sleeve with long horizontal strokes over the entire surface to ensure a uniform bond.

13. Primary Sleeve Installation

While the sleeve is still hot and soft, use a hand roller to gently roll the sleeve surface and push any trapped air up and out of the sleeve, as shown above. Focus on the areas where there is a change in height, both sides of the weld and the cutback edges. Press hard enough to move a little of the adhesive but all of the air. Pressing too hard may cause the sleeve to wrinkle and may cause excess adhesive to be removed from the sleeve. Roll the sleeve from the bottom towards the overlap/underlap seam. Once all the entrapped air is gathered in the underlap/overlap seam roll from the weld out towards the edge of the sleeve in a "V" motion. Continue the procedure by also firmly rolling the closure with long horizontal strokes from the weld outwards. If the sleeve becomes too stiff to roll it may be gently reheated with the torch. Also if the sleeve wrinkles the wrinkle may be removed with gentle heating and rolling.

**14. Primary Sleeve Inspection**

Visually and physically inspect the installed sleeve to ensure that:

- Sleeve is in full contact with the steel joint.
- Adhesive flows beyond all sleeves edges.
- No cracks or holes in sleeve backing
- Proper overlap onto the mainline coating. $\geq 50\text{mm}$ (2")
- No entrapped air
- No large wrinkles

If there is any damage to the main sleeve it must be repaired prior to continuing to Step 15. See "Repairs" for procedure.

15. Sacrificial Sleeve Installation

Ensure that the front 100mm (4") of the first sleeve and 100mm (4") onto the coating is at the required application temperature of 75°C. Remove release liner and heat the adhesive as in Step 8. Wrap the 150mm (6") sacrificial sleeve so that half of the sleeve overlaps the first sleeve and half of the sleeve extends onto the coating. Position the closure so that it does not line up with the first sleeve's closure. Recover the sleeve as in steps 8 to 13. If there is any damage to the main sleeve or the sacrificial sleeve it must be repaired prior to continuing to Step 16. See "Repairs" for procedure.

16. Top Coat Epoxy Mixing

Put on impermeable gloves. Remove the retainer clip from the bubble pack. Place the package onto a room temperature surface and use a J-roller to push all of the base into the cure. Then turn the bag around and push all of the cure into the base. Continue to mix by rolling on one side of the bag then turn it around and roll the other side of the bag. Mix for 1 to 2 minutes. Be careful to not put too much pressure or the bag may rupture.

17. Epoxy Top Coat Application

When the sleeve is between 15 - 40°C, apply epoxy over the sacrificial sleeve to form a wear cone; covering 50mm onto the pipe coating, the entire sacrificial sleeve and 50mm (2") onto the first sleeve. Epoxy applied should thoroughly cover the leading edge of the sacrificial sleeve such that there are no noticeable sharp edges exposed. The epoxy may be applied at higher temperatures but the epoxy will be harder to build up in a single pass and multiple passes may be required. Also applying the epoxy at higher temperatures may cause the epoxy to cure too quickly and it may crack as the sleeve cools. If the epoxy cracks it must be repaired by abrading the crack and at least 25mm (1") around the crack and new epoxy shall be applied so that the crack is filled and the existing epoxy is covered for at least 25mm (1") around the crack.

18. Epoxy Top Coat Application

Apply epoxy to trailing edge of first sleeve; 25mm (1") onto sleeve, 25mm (1") onto adjacent coating. It is best to allow the epoxy to cure at ambient temperature. If necessary, use a low flame to cure epoxy but try to avoid heating the sleeve over 60°C as it will soften the adhesive and could cause the cured epoxy to crack as the sleeve cools. Epoxy applied should thoroughly cover the edges of the sleeves. Cover the entire sleeve with any left-over epoxy.

19. Completed Sleeve Inspection

Visually inspect the installed sleeve to ensure that:

- No cracks or holes in sleeve backing
- Epoxy top coat is complete
- No cracks in the epoxy topcoat

Repairs

The TBK-60 sleeve shall be repaired using approved products. No repairs shall be overlap onto epoxy topcoat that is applied onto a sleeve or the PE mainline coating. If a repair needs to be done in a location with epoxy topcoat under a repair the epoxy topcoat must be removed prior to the application of the repair. CRPO is for repairing damage from a pinhole up to 50mm (2") in diameter. A partial sleeve wrapped fully around the pipe can be used to repair damage larger than 50mm (2") and shall have at least 50mm (2") of overlap onto undamaged coating when fully installed. A full sleeve can be cut down in width from its original width. The smallest width allowed is 150mm (6"). Larger repairs can be made using a sleeve cut down to a maximum of 300mm (12"). If the damage to be repaired is larger than this can cover then you must do a full sleeve removal and reapplication of a new sleeve. Once the repair is complete it must be completely covered with the epoxy topcoat and the leading edge and the trailing edge plus 25mm (1") past.

Note: Small repairs when heated to the repair products application temperature may cause the damage to increase in size.

See the appropriate MQAP for the above products for correct installation.

Prior to Pulling

Allow the epoxy topcoat to cure hard enough that when a sharp knife is drawn sideways across it the epoxy scratches. If the knife grabs or bounces the epoxy must be cured further and the installed system to cool to a temperature of $\leq 45^\circ\text{C}$ (115°F) prior to pulling. Water quenching can be used once the epoxy is cured to the appropriate hardness.

Storage & Safety Guidelines

To ensure maximum performance, store Shawcor's Canusa products in a dry, ventilated area. Keep products sealed in original cartons and avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental elements. Avoid prolonged storage at temperatures above 35°C (95°F) or below -20°C (-4°F). Product installation should be done in accordance with local health and safety regulations.

These installation instructions are intended as a guide for standard products. Consult your Canusa representative for specific projects or unique applications.

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**Canusa-CPS is registered
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