



ARNGP PROJECT DIRECTIVE

Date: 8/31/2015

Subject: Adhesion Testing – Field Coating

Directive Number: 2015 - 008

An adhesion test shall be performed on an average of 1 in every 50 coated welds, as well as on a minimum of one coated weld in the string for each HDD installation.

The instructions for completing these tests, "**QA/QC Adhesion Test for Field Applied Coatings (Revision 0)**," is attached to this directive.

Any questions on adhesion should be directed to Chris LeForce, Eric Curtis or Andrew Coburn.

Issued by (print): Kristy Oxholm (for Chris LeForce)

Signature: 

QA/QC Adhesion Test for Field Applied Coatings (Revision 0)

Project: Addison Rutland Natural Gas Project (ARNGP) – Phase I

Purpose: Complete a random QA/QC adhesion test on all field-applied coatings to girth welds. The goal is to limit the amount of destructive testing on the pipeline coatings. In some tests, an environment similar that in which the coating is being applied, will be created to conduct the test.

Coatings: The two types of field-applied coatings used are:

- Heat-Shrinkable Sleeve Coating
 - Canusa K-60 Corrosion Protective Heat-Shrinkable Sleeve – a wraparound sleeve designed for corrosion protection of buried and exposed steel pipelines.
- Epoxy Coating
 - Powercrete® R-95 Liquid Epoxy – a single coat 100% solids, high build epoxy novolac that coats, repairs and rehabilitates pipelines.
 - Denso® Protal 7200 Pipeline Coating – a two-part epoxy coating specially formulated to compliment FBE coated pipe.

Adhesion Testing: There will need to be two different types of tests performed due to the two different types of coatings.

Heat-Shrinkable Sleeve Coating

A pull off peel strip test will be the testing method for adhesion of the heat-shrinkable sleeve coatings. Please follow the *Canusa-CPS Field Peel Test and Repair Procedure* for instructions on how to perform the test.

The test will be performed on an actual field coated weld and will be repaired using the *Canusa-CPS Field Peel Test and Repair Procedure*.

Epoxy Coating

A pull off test using a PosiTest® Pull-Off Adhesion Tester will be the method for testing adhesion of epoxy coatings. Please follow the *PosiTest® Pull-Off Adhesion Tester Instruction Manual (v. 4.0)* for testing instructions.

To conduct the test, a sample pipe will be needed and prepared in the same manner as any production weld. After a production weld is coated, the excess coating from the coating batch will be applied to the sample pipe for adhesion testing. All procedures shall be followed for application of the coating.

QA/QC Adhesion Test for Field Applied Coatings (Revision 0)

The test will stop and be considered successful at the point of exceeding the manufacturer's given adhesion pressure of the particular epoxy coating.

Adhesion Pressures

Powercrete® R-95 Liquid Epoxy	→	3,550 psi
Denso® Protal 7200 Epoxy	→	3,200 psi

Test Frequency: An adhesion test shall be performed on an average of 1 in every 50 coated welds. Also on any horizontal direction drill (HDD) installation, a minimum of one adhesion test, using the sample pipe test above, shall be performed on the pipe string being installed.

Test Documentation: All adhesion tests shall be documented on the proper *Field Adhesion Test Report* form contained in the *Inspector Manual*.

Supporting Attachments/Documents:

- PosiTest® Pull-Off Adhesion Tester – Instruction Manual (v. 4.0)
- Powercrete® R-95 Liquid Epoxy – Product Data Sheet
- Powercrete® R-95 Liquid Epoxy – Application Guide (Manual/Kit Application)
- Denso® Protal 7200 Pipeline Coating – Product Data Sheet
- Denso® Protal 7200 Pipeline Coating – Brush Application Specifications
- Canusa-CPS Field Peel Test and Repair Procedure
- Canusa K-60 Corrosion Protective Heat-Shrinkable Sleeve – Product Data Sheet
- Canusa K-60 Wrapid Sleeve™ Corrosion Protective Heat-Shrinkable Sleeve – Application Guide
- Canusa K-60 CanusaWrap™ Corrosion Protective Heat-Shrinkable Sleeve – Application Guide

PosiTest[®]

Pull-Off Adhesion Tester

INSTRUCTION MANUAL v. 4.0

PosiTest AT-M
(manual)



PosiTest AT-A
(automatic)

DeFelsko[®]

Introduction

The portable, hand-operated *PosiTest Pull-Off Adhesion Tester* measures the force required to pull a specified test diameter of coating away from its substrate using hydraulic pressure. The pressure is displayed on a digital LCD and represents the coating's strength of adhesion to the substrate.

In accordance with ASTM D4541, D7234, ISO 4624 and others, the *PosiTest* evaluates the adhesion (pull-off strength) of a coating by determining the greatest tensile pull-off force that it can bear before detaching. Breaking points, demonstrated by fractured surfaces, occur along the weakest plane within the system consisting of the dolly, adhesive, coating layers and substrate.

NOTE: Throughout this manual, the **(W)** symbol indicates more information about the particular topic or feature is available on our website.

Go to: www.defelsko.com/manuals

Basic steps for testing coating adhesion with a PosiTest Adhesion Tester:

1. Dolly & Coating Preparation

The dolly and the coating are cleaned and abraded. (see pg. 4)

2. Adhesive & Dolly Application

The adhesive is prepared and applied to the dolly. The dolly is then adhered to the coated surface and the adhesive is allowed to cure. (see pg.4)

3. Test Area Separation - *Optional step*

The test area of the coating is separated from the area surrounding the dolly by cutting or drilling. (see pg. 5)

4. Pull-off Test

a) PosiTest AT-M (manual) (see pg. 6)

b) PosiTest AT-A (automatic) (see pg. 8)

5. Analysis of Test Results

The dolly and the coating are examined and evaluated to determine the nature of the coating failure. (see pg. 10)

6. Store Pull-Off Test Results - *Optional step*

The PosiTest's internal memory stores maximum pull pressure, pull rate, test duration and dolly size for up to 200 pulls. (see pg. 10)

Step 1: Dolly & Coating Preparation

Dolly Preparation

1. To remove oxidation and contaminants, place the included abrasive pad on a flat surface and rub the base of the dolly across the pad 4-5 times.
2. As required, remove residue left from the abrading process using a dry cloth or paper towel.

Coating Preparation

1. Lightly roughen the coating using the included abrasive pad.

NOTE: As coating abrasion may introduce flaws, it should only be used when necessary to remove surface contaminants, or when the bond strength between the adhesive and the coating is insufficient for pull testing.

2. To promote the bond between the dolly and the coating, degrease the area of the coating to be tested using alcohol or acetone to remove any oil, moisture or dust.

NOTE: Ensure that any alternative abrasion techniques, degreasers or adhesives do not alter the properties of the coating. Test by applying a small amount of degreaser or adhesive to a sample area and observing effects.

Step 2: Adhesive & Dolly Application

Adhesive Selection

The adhesive included in the PosiTest Adhesion Tester kit has been selected due to its versatility. This adhesive has minimal impact on a variety of coatings and has a tensile strength exceeding the maximum performance capabilities of the pressure system under ideal conditions. Other adhesives may be preferred based on requirements such as cure time, coating type, working temperature and pull-off strength. Quick curing one-part cyanoacrylates (super glues) may be sufficient for painted surfaces, but two-part epoxies are preferred for porous or rough coatings

Dolly Application

1. Mix the adhesive per manufacturer's instructions and apply a uniform film of adhesive on the base of the dolly (approximately 2-4 mils or 50-100 microns for best results)
2. Attach the dolly to the prepared coating test area.

NOTE: If the coated surface to be tested is overhead or vertical, a means to hold the dolly in place during the cure time may be required, i.e. removable tape.

3. Gently push down on the dolly to squeeze out excess adhesive. Do not twist or slide the dolly back and forth on the coating as air bubbles may be generated.
4. Carefully remove excess adhesive from around the edges of the dolly with included cotton swabs.
5. Allow to cure per the adhesive manufacturer's instructions

NOTE: Many adhesives cure faster and provide a stronger bond when cured with heat. Similarly, cold environments may cause a longer cure time and weaker bond strength.

Step 3: Test Area Separation

The decision of when to cut around a dolly is dependent on the standard, specification or contractual agreement to which the test is to comply. The primary purpose for cutting through the coating is to isolate a specific diameter test area. When the decision to cut into the coating has been made, it is recommended to cut all the way through to the substrate. As a minimum, it is suggested to carefully cut away excess adhesive from the dolly application process. This typically prevents a larger area of coating from being pulled away from the substrate, resulting in a higher pull-off pressure.

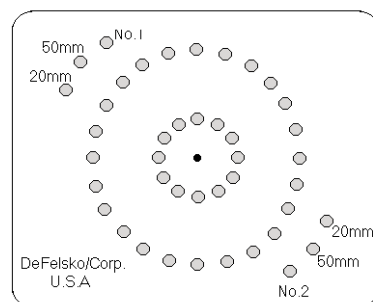
Cutting Instructions

1. Cut through the coating around the edges of the dolly with the included cutting tool, removing any excess adhesive.
2. Clear away any debris from the cutting process.

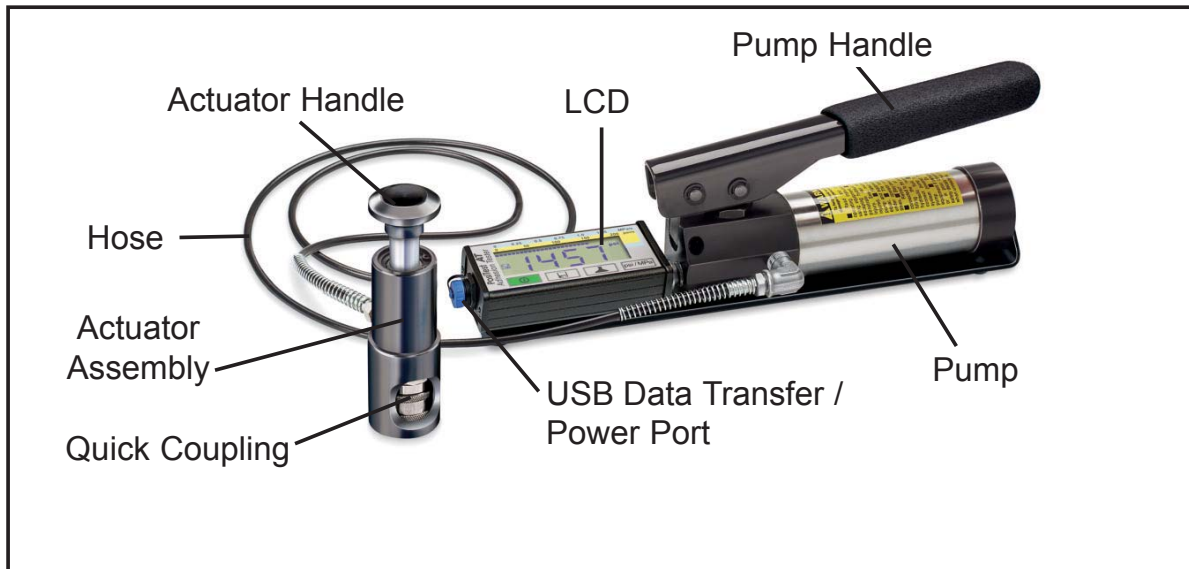
NOTE: - Cutting may induce coating surface flaws such as microcracking that may alter test results.
 - For coatings with strong lateral bonding it is recommended to cut completely through the coating down to the substrate.


Drilling Template

When testing very thick coatings, an optional drilling template may be preferred.




Step 4a: Pull-Off Test (*PosiTest AT-M Manual*)

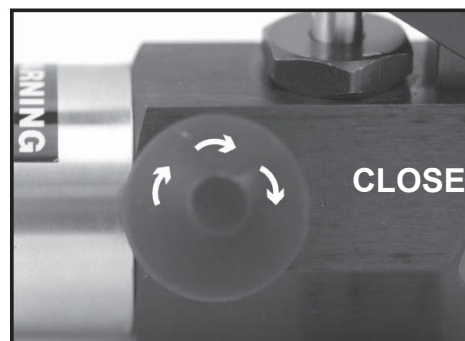
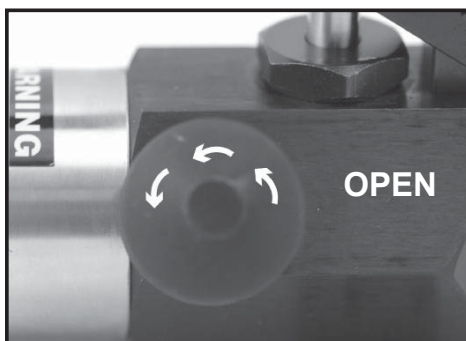


The *PosiTest AT-M* powers-up and displays dashes when the  button is pressed. To preserve battery life, the instrument powers down after 5 minutes of no activity.

Quick Guide


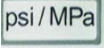

- (1) **Open** the pressure relief valve completely (turn counter clockwise)
- (2) **Connect** the actuator to the dolly
- (3) **Close** the pressure relief valve completely (turn clockwise)
- (4) **Zero** - Press the  Zero button.
- (5) **Pump** pressure into the system until the dolly pulls the coating away

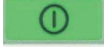
1. Ensure the pressure relief valve on the pump is **completely open**. (turn counter clockwise)



2. Push the actuator handle completely down into the actuator assembly. Place the actuator assembly over the dolly head and attach the quick coupling to the dolly by reaching through the holes in the actuator assembly and lifting the quick coupling. Release the quick coupling when the dolly head is completely engaged.

3. Close the pressure relief valve on the pump **completely**. (turn clockwise)

NOTE: As required, verify and adjust the dolly size by pressing the  button. Select the pressure units by pressing the  button. The instrument will maintain these adjustments even after the  button is pressed.

4. Zero the instrument **BEFORE** pumping by pressing the  button. This prepares the instrument for the test by clearing the display, and zeroing the instrument.

5. Prime the pump slowly until the displayed reading approaches the priming pressure. The priming pressure is the point that the instrument begins calculating and displaying the pull rate. It is also the pressure at which the ability to store readings is enabled. Priming pressures for the various dolly diameters are:

10 mm	400 psi	2.8 MPa
14 mm	200 psi	1.4 MPa
20 mm	100 psi	0.7 MPa
50 mm	50 psi	0.4 MPa


NOTE: For optimum results, prior to exceeding the priming pressure, return the pump handle to its full upright position and then complete a **single stroke** at the desired pull rate until the actuator separates the dolly from the coating.

6. Open the pressure relief valve and remove the dolly from the actuator assembly.

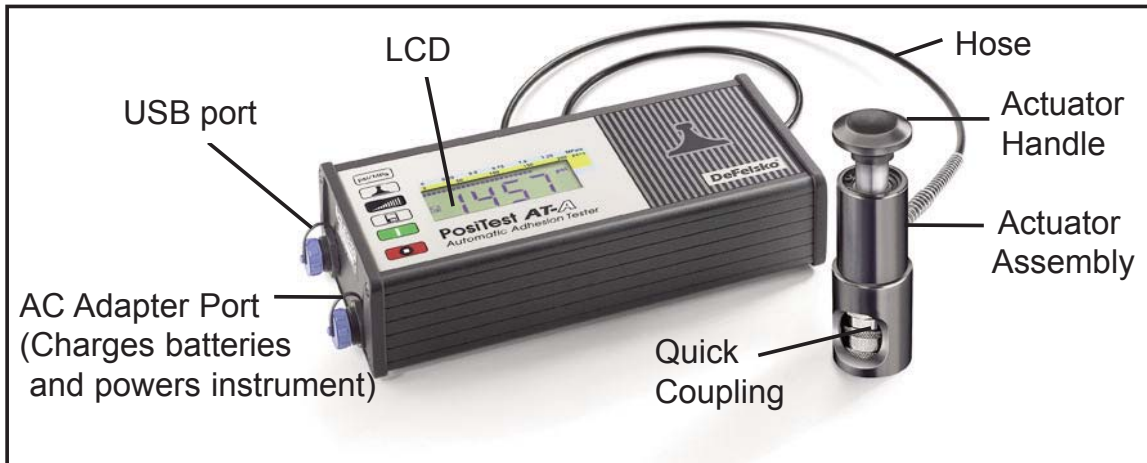
7. Readings may be stored into memory by pressing the  button (pg. 10).

Troubleshooting (PosiTest AT-M) (W)




Digital display “freezes” at a low value

The Tester uses a sudden drop in actuator pressure as an indication that the dolly has been pulled from the surface. The test stops and the highest pressure remains on the display for easy viewing and recording. Pumping up pressure too quickly at the beginning of a test can cause a sudden pressure pulse, fooling the Tester into thinking the test is complete. If this happens, restart the test by opening the pressure relief valve, closing it, then pressing the  button. For more information, see Step 5 above.



Step 4b: Pull-Off Test (PosiTest AT-A Automatic)




Quick Guide


- (1) **Connect** the actuator to the dolly
- (2) **Power-up** with the  button
- (3) **Verify** measurement units, dolly size and pull rate
- (4) **Ready** the instrument with the  button
- (5) **Test** with the  button

1. Place the actuator assembly over the dolly head and attach the quick coupling to the dolly by reaching through the holes in the actuator assembly and lifting the quick coupling. Release the quick coupling when the dolly head is completely engaged.

2. Press the  button to power-up the instrument if necessary. The instrument will power-down after 5 minutes of no activity or by holding the  button for 2 seconds.


3. Check settings:


(a) Verify displayed measurement units. Change with the  button if necessary.

(b) Verify dolly size with the  button and change if necessary.

(c) Verify pull rate with the  button and change if necessary. The following user selectable rates are available:


Dolly Size	PSI Rates	MPa Rates
10 mm	125, 200, 400, 600, 725	1.00, 2.00, 3.00, 4.00, 5.00
14 mm	60, 100, 200, 300, 360	0.40, 0.70, 1.40, 2.00, 2.50
20 mm	30, 50, 100, 150, 180	0.20, 0.30, 0.70, 1.00, 1.20
50 mm	5, 8, 16, 24, 30	0.04, 0.08, 0.12, 0.16, 0.20

4. Press the  button to ready the instrument. This prepares the PosiTest for the test by clearing the display and zeroing the instrument.

5. Press the  button again to start the test that consists of 4 stages that occur *automatically*:

Stage 1. Initiation - the display shows a blinking "0".

Stage 2. Priming - the pump applies initial pressure to the dolly.

Stage 3. Test - when the priming pressure has been achieved (see step 5 on pg. 7) the instrument begins calculating and displaying the pull rate established by the user. Pressure build-up stops when the dolly is pulled from the surface or when the  button is pressed.


Stage 4. Retraction - the maximum pull-off pressure value blinks on the display while the pump retracts the actuator. The buttons are locked during this stage.

 **CAUTION:** *To avoid injury, keep fingers away from the quick coupling and actuator assembly until the pull test has completed and the actuator has been fully retracted. Press  to stop the pull test at any time.*

6. Remove the dolly from the actuator assembly.

7. Readings may be stored into memory by pressing the  button (pg. 10).

All settings and test results in memory are retained during power-down.

The red  button may be pressed to stop the pull test at any time. The maximum pressure value will remain on the display while the pump retracts the actuator. This value can be stored into memory and will be uniquely identified by the optional PosiSoft software. Stopping the pull test before destruction is handy when specifications allow the test to be stopped when required adhesion strengths have been exceeded. Uncouple the actuator from the dolly and then remove the dolly from the surface with a sharp, sideways hammer tap.

Troubleshooting (PosiTest AT-A) (W)

Instrument is unresponsive or will not power down



In the unlikely event that the PosiTest becomes unresponsive or will not power down, press and hold the  button, then press the  button. The instrument will power down.




Step 5: Analysis of Test Results



Test results can be considered 100% valid when the coating is completely removed from the substrate. When only a portion of the coating is removed, specific results should be noted including the fracture pattern to determine the cohesive properties of the coating and adhesion properties between the dolly and adhesive, adhesive and coating, distinct coating layers, and coating and substrate.

Step 6: Storing Pull-Off values into Memory

The PosiTest's internal memory stores maximum pull pressure, pull rate, test duration and dolly size for up to 200 pulls.

Press the  button upon completion of a test to store pull-off test results. The display will show the pull rate and alternate between the test number and the maximum pull pressure for that test. The  icon will appear to indicate that there are test results in memory.


Press the  button repeatedly to view previously stored test results. The *PosiTest AT-A* also displays dolly size  and pull rate  by pressing their respective buttons.

Complete information on all test results can be downloaded to a PC and viewed using the optional PosiSoft software. Test results are not erased from memory after downloading. Press  (*AT-M manual*) or  (*AT-A automatic*) to exit viewing mode.

To remove all stored test results from memory, press and hold the  or  button, then press the  button. The  icon will disappear from the display.

All settings and test results in memory are retained during power-down.


Available Options

A variety of accessories are available to help you get the most out of your PosiTest Pull-Off Adhesion Tester. 

Power Supply / Low Battery Indicator

PosiTest AT-M (manual)

Power Source: Built-in rechargeable NiMH battery (~60 hours continuous)


The built-in rechargeable NiMH batteries** are charged using the included USB AC power supply/charger. Ensure batteries are charged prior to use. The  symbol will blink while the instrument is recharging and disappear when fully charged. The charging process will take up to 14 hours depending on remaining battery power.

Alternatively, the AC power supply or any computer USB port can be used to power and charge the instrument.

PosiTest AT-A (automatic)

Power Source: Built-in rechargeable NiMH battery (>200 pulls with full charge)

The  symbol will appear when remaining battery power is below 35%.

The built-in rechargeable NiMH batteries** are charged using the included AC power supply/charger. Ensure batteries are charged prior to use. The  symbol will blink while the instrument is recharging and disappear when fully charged. The charging process will take 2-3 hours depending on remaining battery power. Alternatively, the AC power supply can be used to power the instrument.

NOTE: The USB port will not charge or power the *PosiTest AT-A*. The USB connection will drain battery power when connected for an extended period of time.

****Do not attempt to remove or replace the internal NiMH battery pack. In the unlikely event power issues are experienced, please contact our technical support for assistance.**

Technical Data

Conforms to: ASTM D 4541, ASTM D 7234, ISO 4624 and others.

Specifications: Resolution: 1 psi (0.01 MPa) Accuracy: ±1% Full Scale

	Dolly Size (mm)	Max Pull-Off Pressure
Adhesion Strength	10 mm	10,000 psi (70 MPa)
	14 mm	6,000 psi (40 MPa)
	20 mm	3,000 psi (20 MPa)
	50 mm*	500 psi (3.5 MPa)

*requires optional 50 mm accessory kit

Calibration

The PosiTest is shipped with a Certificate of Calibration showing traceability to a national standard. For organizations with re-certification requirements, the PosiTest may be returned at regular intervals for calibration. DeFelsko recommends that our customers establish the instrument calibration intervals based upon their own experience and work environment. Based on our product knowledge, data and customer feedback, a one year calibration interval from either the date of calibration, date of purchase, or date of receipt is a typical starting point.

Returning for Service

There are no user serviceable components. Any service must be performed by DeFelsko Corporation.

If you need to return the Instrument for service, describe the problem fully and include reading results, if any. Be sure to include contact information including your company name, company contact, telephone number and fax number or email address.

www.defelsko.com/support

Limited Warranty, Sole Remedy and Limited Liability

DeFelsko's sole warranty, remedy, and liability are the express limited warranty, remedy, and limited liability that are set forth on its website:

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The Measure of Quality

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Every effort has been made to ensure that the information in this manual is accurate. DeFelsko is not responsible for printing or clerical errors.

Powercrete® R-95 Liquid Epoxy



Product Description

Powercrete R-95 is a single coat, 100% solids, high build epoxy novolac that coats, repairs and rehabilitates pipelines operating at maximum temperatures up to 95°C (203°F). As an abrasion resistant overlay (ARO) it is compatible with FBE and CTE mainline coatings and can be used on any metal structure. This 2-component, solvent-free epoxy can easily achieve a dry film thickness of up to 40 mils in a single application and can be hand or spray applied.

Typical Applications

- Pipeline Repair & Rehabilitation
- Girth Welds / Field Joints
- Pipe Bends, Fittings, Valves & Odd Shapes
- Any bare steel structure in need of protection

Product Features & Benefits

- 100% Solids Epoxy; No V.O.C.s and no isocyanates
Safe to use
- Novolac Chemistry
Greater surface tolerance and chemical resistance
- Excellent Wetting Properties to Bare Steel
Exceptional adhesion and cathodic disbondment resistance
- Same Formula for Hand or Spray Application
Reduce inventory
Easy selection to avoid errors
- High Build in a Single Application
Save time by applying 40+ mils in a single pass
- Excellent Mechanical Properties
Used in directional drill and thrust bore applications

Physical Properties

Property	Condition	Test Method	Typical Value	
			US Imperial	Metric
Specific Gravity	(Mixed)	ASTM D-3289-03	1.64	1.64
Compressive Strength		ASTM C-109	14,660 psi	110 MPa
Hardness	(Shore D)	ASTM D-2240	85	85
Thin Film Water Absorption	24 Hrs	ASTM D-570	0.15 %	0.15 %
Dielectric Strength	(Oil)	ASTM D-149	690 volts/mil	27 volts/micron
Resistance to Acids & Alkalies		ASTM C-581	Excellent	Excellent
Adhesion to				
FBE		ASTM D-4541	3,400 psi	23.44 MPa
Bare Steel		ASTM D-4541	3,550 psi	24.48 MPa
Impact Resistance	(40 mils thickness)	ASTM G-14-88	57 inch lbs	6.4 Nm/6.4 Joules
Flexibility	(Degrees per pipe diameter)	NACE RP-0394	0.15° to 0.19°	0.15° to 0.19°
Tabor Abrasion	(CS-17 wheel, wear cycles)	ASTM D-4060-95	780 cycles/mil	30 cycles/micron
Cathodic Disbondment	30 days			
23°C (73°F)		ASTM G-8	0.2 inch	4.0 mm
95°C (203°F)		ASTM G-42	0.3 inch	8.0 mm
Holiday Detection	Holiday free	ISO :21809-3 & CSA Z245.20 ASTM G 62 Method B	125 Volts per mil 84 Volts per mil	5 Volts per micron 3.3 Volts per micron

Product Selection Guide

Maximum Operating Temp	95°C (203°F)	Color	Gray
Compatible Line Coatings	FBE, CTE	Typical Single Coat Thickness	
Mixing Ratio		Manually Applied	40 mils (1.0 mm)
By Volume	3.6:1 Part A to B	Spray Applied	40 mils (1.0 mm)
By Weight	100:16 Part A to B	Recoat Interval (Spray)	
Surface Profile Recommended	2.5 - 4.0 mils 63.5 - 101.6 microns	@ 21°C, 70°F	34 - 60 minutes
Surface Preparation	SA 2 1/2 SSPC-10 - Near-White SSPC-SP5 - White	@ 65°C, 150°F	4 - 7 minutes
		Clean Up	Acetone, MEK

Typical Application

Hand Apply

Spray Apply

Waste Factor



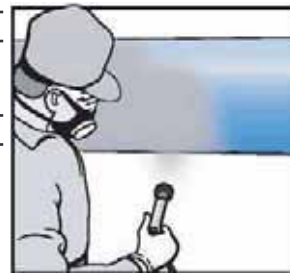
Theoretical Coverage Rates

425 mil-sq. ft./litre
1605 mil-sq. ft./US gallon
1.0 mm-m²/litre

Recommended Tip Sizes

Tip Size	Pipe Size (DN)	Flow Rates (approx.)
331	to 12" (DN300)	19tip = 1.1 L / min.
419/431	12"-16" (DN300-400)	31tip = 2.8 L / min.
519/531	16"-24" (DN400-600)	
619/631	24"-48" (DN600-1200)	

Note: Fluid pressure at tip Approx. 3,500 psi.



(approx.)	
10%	Kit Application
15%	20" + pipe OD
25%	14"-18" pipe OD
35%	2"-12" pipe OD

Temperature Considerations

If the surface to be coated is below 10°C (50°F), preheating of the substrate is recommended. Preheat temperatures should not exceed 100°C (212°F) prior to the application.

Note: The application should only be done when the temperature of the steel is at least 3°C (5°F) higher than the dew point, as recommended by NACE.

Storage & Handling

For optimum performance, store Powercrete® R-95 epoxy products in a dry, well-ventilated area. Maintain products in original packaging and sealed until just before use. Avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental conditions or contaminants.

NOTE: Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (40°F).

Cure Times

Pot Life: 4 Lbs Kit (1.82 Kg), @ 25°C (77°F)	14 minutes
Spray Application	
Gel Time: 40 mils, @ 27°C (80°F)	31 minutes
Dry Time: 40 mils, @ 27°C (80°F)	77 minutes
65 Shore "D" Reading: 40 mils, @ 27°C (80°F)	2.2 hours
75 Shore "D" Reading: 40 mils, @ 27°C (80°F)	5 hours
Application Temp Range	-30 to 100°C -20 to 212°F
Shelf Life (stored in specified conditions):	2 years

Ordering Information

Powercrete R-95 is available in three (3) packaging options:

Drum

Part A: 40 Gal / 153 L (625 Lbs / 283.5 Kg)
Part B: 46 Gal / 176 L (400 Lbs / 181.4 Kg)

Pail

Part A: 4 Gal / 15.1 L (61.7 Lbs / 28 Kg)
Part B: 4.6 Gal / 17.4 L (39.5 Lbs / 18 Kg)

Kit Options (Part A and B in proper mix ratio by weight)

20 Lbs / 9.08 Kg (1.44 Gal / 5.44 L)
10 Lbs / 4.53 Kg (0.72 Gal / 2.7 L)
4 Lbs / 1.82 Kg (0.29 Gal / 1.09 L)
2 Lbs / 0.91 Kg (0.14 Gal / 0.54 L)



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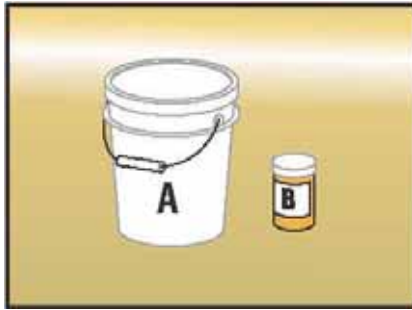
Application Guide

Manual / Kit Application

Powercrete® R-95

Powercrete R-95 is a 100% Solids Epoxy used for corrosion and abrasion protection. This coating is applied over clean, bare steel and adjacent plant applied or mainline coatings. The application is fast and easy. Simply follow these guidelines.

1. Product



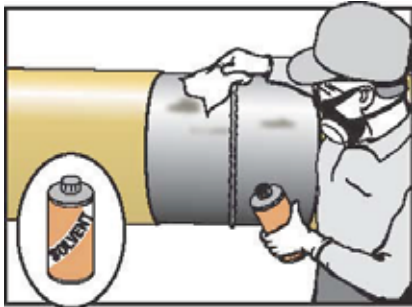
1. The 2-component epoxy coating is supplied in pre-measured kits. Part A (large container) is the Base and Part B (small container) is the curing agent.

2. Application Kit (ordered separately)



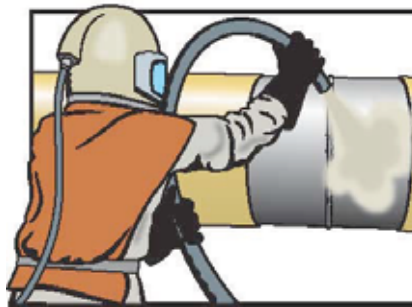
2. The "Application Kit"* contains a mask, Wet Film Gauge, Gloves, trowels, a PE stir stick, and abrasive paper.

3. Surface Preparation



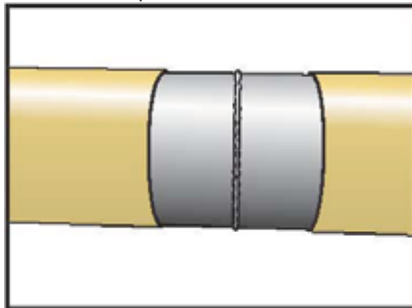
3. Insure that surfaces are clean of grease, oil, salts and other contaminants. If necessary, use Acetone, MEK or other suitable solvent. Perform cleaning when pipe is 3°C (5°F) above dew point.

4. Surface Preparation



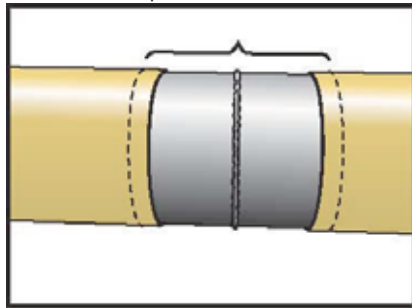
4. Blast clean surfaces to a near white ISO-8501, NACE No. 2, SA-21/2 (SSPC-SP 10) or better using particle blasting (sand or other). Sweep blast adjacent FBE or CTE coating. 50 mm (2") to either side of cutback (the bare steel area)

5. Surface Preparation



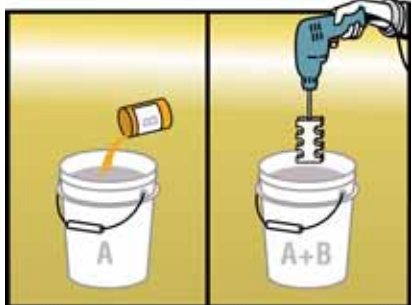
5. A 2.5-4 mil (63.5-101.6 micron) surface profile with sharp angularity. Burnishing or polishing must be avoided. Surface preparation can be controlled using surface profile tape. Dry surface and insure ideal surface preparation.

6. Surface Preparation



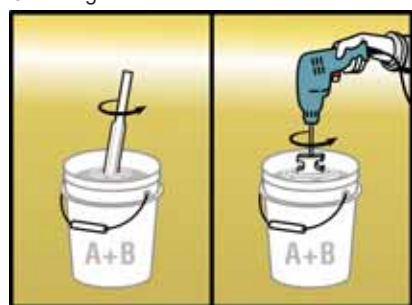
6. While not always necessary, preheating can be useful just prior to application.
A. To eliminate moisture, preheat the cutback area to approximately 40°C (104°F).
B. To accelerate curing, preheat the cutback area to approximately 90°C (194°F).

7. Combining & Mixing



7. Warm parts A & B to 20°C (68°F) and mix by pouring all of part B into part A. Thoroughly scrape container and lid of B. Slowly begin mixing to avoid introducing air into the mixture.

8. Mixing

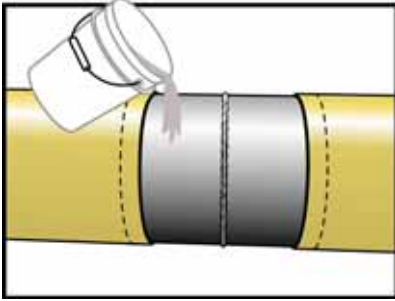


8. Use a mixing speed that uniformly blends the 2 parts, but does not create a vortex in the mixture or spillage.

Note: Between 20°C (68°F) & 40°C (105°F), mix for 2 - 3 minutes with a drill mixing paddle or 4 - 5 minutes with the stir stick. Blend both parts to create a uniform color with no streaks.

*Berry Plastics does not supply these kits.

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9. Reconfirm that the application temperature is above 10°C (50°F)* & 3°C (5°F)* above the dew point. Then slowly pour mixed epoxy onto pipe. See "Tips" below for additional suggestions.

10

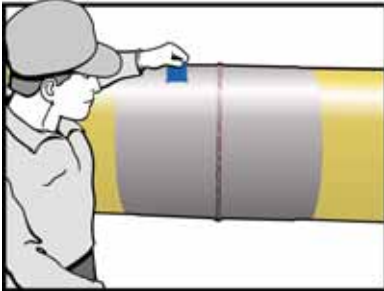


10. Use trowels, brush or roller to apply required minimum thickness of coating to the Field Joint. Cover at least 50mm (2") of the adjacent mainline coating.

Tip: Masking tape may be applied to left & right 50mm (2") beyond cutback (see dotted lines) and later removed while the coating is still tacky to create a straight edge and neat appearance

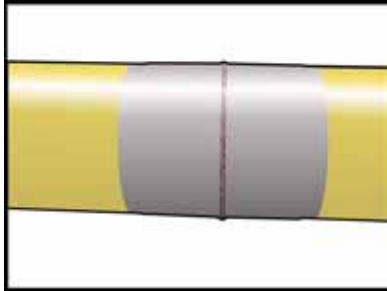
***Note:** Powercrete R-95 may be applied and cured at colder environmental temperatures if the pipe is heated during the application and cure..

11



11. Use a Wet Film gauge to measure that the desired minimum thickness has been achieved. Double check around the weld to insure minimum desired thickness.

12



12. The curing rate* will vary according to pipe and ambient application temperature. Refer to curing rate chart to determine when to perform a Shore D check.

Storage

For optimum performance, store Powercrete® Epoxy products in a dry, well-ventilated area. Maintain products in original packaging and sealed until just before use. Avoid exposure to direct sunlight, rain, snow, dust or other adverse environmental conditions or contaminants.

NOTE: Avoid prolonged storage at temperatures above 40°C (104°F) or below 5°C (40°F).

Safety Guidelines

Important: Read the MSDS prior to using the products. Product installation should be done in well-ventilated area and in accordance with local health and safety regulations. These application guidelines are intended as a guide for standard products. Consult your Berry Plastics representative for specific projects or unique applications.

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



CORROSION PROTECTION GROUP
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PROTAL 7200

Fast Cure, High Build Pipeline Coating

Description

Protal 7200 is a VOC free, 100% solids, 2 part epoxy coating specially formulated to compliment FBE coated pipe. It is a high build liquid coating that is brush or spray applied (referred to as Protal 7250 in Canada) in one coat in the field or shop. It cures very fast to allow quick handling and backfill times.

Uses

On-site protection of girth welds, tie-ins, welds for boring applications, repairs to FBE, push-rack applications, station piping, fittings and fabrication. Also used for main line pipe coating, sacrificial coating for directional drill (ARO) and road bore pipe, and rehabilitation of existing pipelines.

Features

- Fast touch dry and set times
- High temperature resistance up to 203°F (95°C)
- High build (up to 50 mils in one coat)
- Excellent adhesion (compliments FBE coated pipe)
- High abrasion resistance for drilling applications
- Can be used as an abrasion resistant coating (ARO)
- Safe and environmentally friendly
- Does not shield cathodic protection
- Can be applied with brush, roller or spray
- Available in a variety of packaging options
- Meets AWWA C-210-92 specifications

Application

Brush: Prepare surfaces by grit blasting to a clean near white finish, SSC-SP 10/ NACE No. 2. Appropriate angular grit shall be used to achieve a 2.5 to 5 mil anchor profile. Initially stir the base and hardener. Add the hardener to base and mix at a slow speed until a constant color is achieved making sure all sides of container are scraped. Apply mixed material onto surface and brush, trowel or roll to required mil thickness. A wet film thickness gauge shall be used to measure mil thickness. If surface temperature falls below 50°F (10°C), surface should be preheated to achieve faster cure. Preheat may be achieved with a propane torch or induction coil. Resin and hardener component shall be kept warm, at a minimum of 60°F (15°C), to mix easily.

Spray: Prepare surfaces by grit blasting to a clean near white finish, SSC-SP 10/ NACE No. 2. The equipment should be a plural component airless spray unit with a proportioning pump capable of a volume mixing ratio of 3:1. Standard ancillary equipment should include minimum 10 gallon hoppers, 2 ea. static mixers, 25 ft. max x 1/4" whip hose, and mastic gun with a 19 to 27 thou tip. (Applicator should consult with Denso regarding recommended equipment). Part A should be heated to 140°F - 160°F and Part B heated to 100°F - 110°F. Hose bundle shall be set at 140°F - 150°F. A wet on wet spray technique should be used to achieve a minimum thickness of 20 mils. The coating thickness should be measured using a wet film thickness gauge. The equipment settings are only guidelines and may vary based on equipment.

For complete application instructions please refer to Protal 7200 application specifications.



Protal 7200

TECHNICAL DATA

PROPERTIES	VALUE
Solids Content	100%
Base Component - (Unmixed) @ 77°F (25°C)	
Specific Gravity	1.63
Viscosity	255,000 cps
Color	White
Hardener - (Unmixed) @ 77°F (25°C)	
Specific Gravity	1.05
Viscosity	5,500 cps
Color	Dark Green
Mixed Material - (Mixed) @ 77°F (25°C)	
Specific Gravity	1.63
Viscosity	170,000 cps
Color	Green
Mixing Ratio (A/B) by Volume	3 Parts Base: 1 Part Hardener
Cure Times	
Pot Life @ 77°F (25°C)	14 - 17 Minutes
Pot Life @ 97°F (36°C)	7 - 8 Minutes
Handling Time @ 77°F (25°C)	2.5 - 3 Hours
Handling Time @ 117°F (47°C)	1 Hour
Handling Time @ 157°F (69°C)	20 Minutes
Recoat Window	
@ 57°F (14°C)	5 Hours
@ 77°F (25°C)	2 Hours
@ 97°F (36°C)	1 Hour
Theoretical Coverage	14 ft ² /30 mils/liter
Thickness - Weld Joints / FBE Repairs	
Minimum/Maximum	20/70 mils
Recommended	25 - 30 mils
Thickness - Bore Pipe	
Minimum/Maximum	40/70 mils
Recommended	45 - 60 mils
Holiday Detection - based on min. mil. thickness specified	125 volts/mil
Cathodic Disbondment Test (ASTM G95)	
28 Days @ 77°F (25°C)	3 mm
28 Days @ 150°F (65°C)	4 mm
28 Days @ 185°F (85°C)	6 mm
28 Days @ 203°F (95°C)	6 mm
Hardness (ASTM D-2240-02)	Shore D 85 +/-2
Impact Resistance (ASTM G14-88)	60.89 in-lbs.
Adhesion to Steel/FBE (ASTM D-4541-02)	3,200 psi
Application Temperature	-30°F to 212°F (-34°C to 100°C)
Service Temperature	-40°F to 203°F (-40°C to 95°C)

Note: If temperature falls below 50°F (10°C), surface must be preheated and maintained throughout the cure process.

STORAGE: Minimum 24 months when stored in original containers @ 40°F (4°C) to 105°F (41°C). On job site where temperatures are below 50°F (10°C) product should be kept warm to mix properly (65°F to 85°F optimal).

CLEANING: Clean equipment with MEK or equivalent solvent cleaner.

HEALTH AND SAFETY: Wear protective clothing and ensure adequate ventilation. Avoid contact with skin and eyes. See material safety data sheet for further information.

PACKAGING: 1, 1.5, 1.75 and 2 liter kits and 75 liter & 800 liter kits standard. Dual cartridge repair tubes (400 ml & 50 ml) and dispensing guns available for small repair areas.



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Protal 7200

Brush Application Specifications

1.0 Scope

- 1.1 This specification covers the external surface preparation and coating of pipeline applications such as weld joints, special pipe sections, fittings and fabrication.

2.0 Material and Storage

- 2.1 Material shall be Denso Protal 7200 coating system as manufactured by Denso North America, 9747 Whithorn Drive, Houston, TX 77095 (Tel) 281-821-3355 (Fax) 281-821-0304 or 90 Ironside Crescent Unit 12, Toronto, Ontario, Canada M1X1M3 (Tel) 416-291-3435 (Fax) 416-291-0898. E-mail: info@densona.com.
- 2.2 Material shall meet the physical properties of the attached product data sheet.
- 2.3 Storage: Material shall be stored in a warm, dry place between 40°F (4°C) to 105°F (41°C). Care shall be taken to insure the material is stored up right (arrows on boxes facing up). *Note: If the material is kept cold, it will become very viscous.*

3.0 Equipment

- 3.1 For mixing, use strong wooden stir sticks or power drills with appropriate mixing paddle.
- 3.2 For application, use 4" wide brushes, Denso applicator pads or Protal 9" roller.
- 3.3 Wet film thickness gauges.

4.0 Surface Preparation

- 4.1 All contaminants shall be removed from the steel surface to be coated. Oil and grease should be removed in accordance with SSPC SP-1 using non-oily solvent cleaner (i.e., xylene, MEK, ethanol, etc.).
- 4.2 Material for abrasive cleaning shall be the appropriate blend of grit to produce an angular surface profile of 2.5 - 5 mils (0.063 - 0.125 mm).

- 4.3 All surfaces to be coated shall be grit blasted to a near-white finish (SSPC SP-10, NACE No. 2 or Sa 2 1/2). *Note: Near-white finish is interpreted to mean that all metal surfaces shall be blast cleaned to remove all dirt, mill scale, rust, corrosion products, oxides, paint and other foreign matter. Very light shadow, very light streaks or slight discolorations shall be acceptable; however, at least 95% of the surface shall have the uniform gray appearance of a white metal blast-cleaned surface as defined by Swedish Pictorial Surface Preparation Standard Sa 2 1/2 or SSPC VIS-1.*
- 4.4 Edges of the existing coating shall be roughened by power brushing or by sweep blasting the coating for a distance of 1" (25 mm) minimum.
- 4.5 The Contractor shall check the surface profile depth by using a suitable surface profile gauge (Press-O-Film Gauge or equal).
- 4.6 Metal areas that develop flash rust due to exposure to rain or moisture shall be given a sweep blast to return them to their originally blasted condition.

5.0 Application

- 5.1 The surface shall have no condensation, precipitation or any other forms of contamination on the blasted surface prior to coating.
- 5.2 The substrate temperature range for application of Protal is 50°F (10°C) to 212°F (100°C). The substrate temperature must be a minimum of 5°F (3°C) above the dew point temperature before proceeding with the coating operation. Ambient temperature may be lower than 50°F (10°C) if the substrate is heated. Preheating may be accomplished with a propane torch or induction coil prior to abrasive blasting.
- 5.3 Protal shall be applied to the specified Dry Film Thickness (DFT) using a brush, Denso applicator pad or roller. Wet film measurements shall be performed to ensure close adherence to the thickness specification.
- 5.4 Mixing: Make sure the part A (Resin) and Part B (Hardener) components match in both material and size as specified on the containers. Mix the B component first, independent of the resin. Pour the contents into the part A (Resin) component. Mix at a slow speed so as not to

create a vortex that could introduce air into the product until a uniform color is achieved making sure to scrape the bottom and sides of the container (approximately 2 minutes). No streaks shall be visible.

- 5.5 APPLICATION SHALL TAKE PLACE IMMEDIATELY AFTER MIXING. Apply the product onto the surface and spread down and around the surface in bands beginning from the leading edge of the material to as far under the pipe as can be reached. Overlap the bands and onto the existing coating a minimum of 1". Applicators shall use a brush to smooth out any obvious sags or rough edges, valleys, or drips. Special attention shall be given to weld buttons and bottom surfaces.
- 5.6 The thickness of Protal shall be checked periodically by wet film gauge to achieve the minimum and maximum wet film thickness specified. After the Protal has cured, the owner's representative and/or contractor's inspector should measure the film thickness by magnetic gauge and notify the applicator of their acceptance. Notification to the applicator of any inadequately coated sections must be made immediately.
- 5.7 Over-coating, when necessary, shall take place within 2 hours at 80°F (27°C). If recoat window has lapsed, the surface shall be roughed prior to application of the topcoat using 80 grit sand paper or by sweep blasting.

6.0 Inspection/Testing for Backfill

- 6.1 The finished coating shall be smooth and free of protuberances or holidays. All surfaces shall have the required minimum/maximum DFT. Inspection of brush application is best performed immediately after application.
- 6.2 Backfill time shall be determined by the "thumb nail test". The thumb nail test is defined by when one can no longer make a permanent indentation in the coating with his or her thumb nail. *Note: A full and/or chemical cure may not be achieved by backfill time. Therefore, in wet soils or water the coating will need a full chemical cure. (refer to Section 6.3 for acceptable field test for chemical cure)*
- 6.3 An acceptable field test to check to see if the coating has a full chemical cure, a solvent such as Xylene, MEK or Toluene can be rubbed on to the coating. If the gloss / sheen is removed the coating is not fully cured.
- 6.4 Spark testing shall be performed to ensure proper film thickness and for holiday inspection. The voltage used for testing weld joints and field applications shall be equal to that used for testing the mainline coating in the field or 125 volts/mil. based on the specified min. mil. thickness.

- 6.5 Denso and/or the owner's representative immediately upon completion of the work shall make final inspection of the completed application. Notification of all defects must be made within a reasonable time frame from completion of the work to allow for all repairs within the allowed time frame for the project.

7.0 Repairs

- 7.1 Pinhole repairs may be repaired by using Protal Repair Cartridge. Areas shall be roughened a minimum 1 in. around holiday using Carborundum cloth or 80 grit sandpaper and wiped clean with a xylene soaked cloth prior to patching.
- 7.2 Areas larger than 0.15 sq. in. (0.3 sq. cm.), but less than 1.0 sq. ft. (100 sq. cm.) shall be repaired using a Protal Repair Cartridge. The surface to be coated shall be clean and dry prior to applying the coating. Surfaces below 40°F (4°C) shall be pre-heated in accordance with Section 5.2. Areas requiring repair shall be prepared with a surface grinder or by grit blasting prior to application of the coating. All edges of the surrounding area should be feathered prior to performing the repair.
- 7.3 Refer to "7200 Accelerated Cure Specifications for Repairs" for additional information.

8.0 Safety Precautions

- 8.1 Follow the guidelines detailed in the Material Safety Data Sheets (MSDS).
- 8.2 Keep containers closed when not in use. In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations.
- 8.3 Always refer to project specifications as they may supercede Denso specifications.



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Field Peel Test & Repair Procedure

Scope

This procedure describes how to test the adhesion of a heat-shrinkable sleeve after installation and how to repair the tested area.

Factors

For most major projects, the peel test and several other performance tests are dictated within the specification. The specification prescribes the conditions and procedures to be used, including the following items:

- Test temperature (°C / °F)
- Sample dimension (width and length)
- Rate of pulling (crosshead speed)
- Minimum/maximum load
- Mode of failure
- Percentage of voids
- Test frequency
- Test instrumentation

Published peel values are based on data obtained in a laboratory environment where the temperature and rate of pull can be accurately applied. Under field conditions, temperature variations or the rate of peel will cause peel value and mode of failure fluctuations.

Important points to consider are as follows:

- Higher sleeve temperatures translate to lower peel strength values
- Lower temperatures generally result in higher peel strength values, but can also change the mode of failure from cohesive to adhesive failure from the backing (likely resulting in lower peel values overall)
- High peel speeds generate higher peel strength values
- Low peel speeds generate lower peel strength values

A minimum of 4 hours should elapse (preferably 24 hours) between the sleeve application and the peel test. This allows the sleeve to achieve the maximum bond strength and the sleeve / substrate to reach thermal equilibrium.

In summer or hot climates, the peel test should be performed in the morning or evening when the ambient temperature is closest to 20-25°C. In winter or arctic conditions it may not be possible to achieve the preferred test temperature. The option to internally or externally heat the surface of the test area is not recommended. This will not result in accurate temperature readings and the outcome will be a false peel value and/or change in failure mode.

Peel testing is specified for two reasons:

1. To check the performance quality of the bond relative to the manufacturer's and customer(s) specifications
2. To check the quality of application, including the adhesion to the bare metal substrate and mainline coating, and for the presence of air voids

The customer and/or inspector will dictate the position of the peel test.

Frequency of Testing:

Typically, one peel test is conducted for each 100 sleeves installed or for every day of production, whichever is least frequent.

Apparatus Required:

- Utility knife
- Pen/marker
- Tape measure or ruler
- Peel clamp or vice grips
- Pliers
- Peel gauge (manual or digital)
- Pyrometer
- Screw driver or prying tool
- Propane torch
- Flat sleeve roller

Test Procedure:

1. Prior to the sleeve application, the field joint shall be inspected visually for the absence of oil, grease and weld splatter. Clean any contaminated surface with an oil free solvent and clean cloth. Prepare the surface using the surface preparation and preheat guidelines as recommended by the manufacturer
2. Apply the sleeve in accordance with manufacturer's installation literature
3. After the sleeve has been installed, wait a minimum of 4 hours prior to starting the test procedure. Note: Mastic adhesive type shrink-sleeves are more forgiving and can be water quenched if necessary. Hot melt adhesives and 3-layer systems (including an epoxy primer) must be allowed to cool for 12-24 hours.
4. Make a 25 mm (1") width x 150 mm (6") length outline with a pen or marker in the circumferential direction of the sleeve at the site chosen for the field peel test procedure
5. Using the utility knife, cut the outline down to the steel or mainline coating surface

6. Utilizing the screwdriver or prying tool, pry up the first 50 mm (2") of the peel strip
7. Attach the peel clamp or vice grips to the peel strip
8. Using the pyrometer, measure and record the temperature at the point of peeling. Note: use the sleeve to record the date, customer, joint ID (if available), temperature and result. Photograph the completed peel test and include with any relevant report.
9. Attach the peel gauge to the peel clamp and pull at a rate of 100 mm (4") per minute. This translates to a total time of 1 minute to peel the entire test strip. Note: in cold conditions it may be necessary to slow the rate of peeling to avoid elongating or delaminating the backing.

Results

Compare the peel value with the specified peel value as published on the manufacturer's product data sheet and/or available literature.

Record the peel value and the mode of failure (i.e. cohesive, adhesive from backing or adhesive from the substrate).

Record the presence of air voids (if applicable).

Pass or fail criteria may be subjective depending on the test temperature. Generally, a cohesive mode of failure, leaving some adhesive on the substrate and some on the backing is an acceptable result.

Sleeve Repair

1. Gently heat the peel strip and press back down to the joint surface, filling the uncoated region as completely as possible
2. Cut a piece of Canusa CRP repair material into a 100 mm (4") x 200 mm (8") rectangle. Trim the corners of the patch to approximately 45°
3. Remove the release liner and heat the adhesive side with the propane torch until the adhesive becomes glossy (molten)
4. Gently heat the peel strip repair area with the propane torch and apply the CRP patch over the peel strip, using a minimum overlap of 50 mm (2") on all sides of the damaged area
5. Heat the CRP repair patch and roll with a flat roller to ensure contact

K-60

Corrosion protective heat-shrinkable sleeve

For more than 35 years, Canusa-CPS has been a leading developer and manufacturer of specialty pipeline coatings for the sealing and corrosion protection of pipeline joints and other substrates. Canusa-CPS high performance products are manufactured to the highest quality standards and are available in a number of configurations to accommodate many specific project applications.

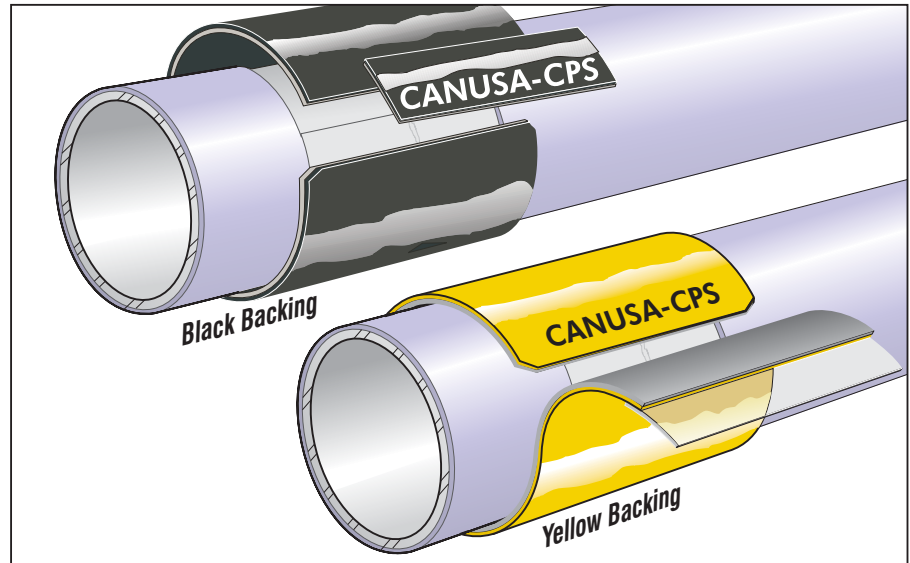
Product Description

The Canusa K-60 wraparound sleeve is designed for corrosion protection of buried and exposed steel pipelines operating up to 60°C (140°F). K-60 consists of a crosslinked polyolefin backing, coated with a technologically advanced corrosion protective adhesive, which effectively bonds to steel substrates and common pipeline coatings including polyethylene and fusion bonded epoxy.

Features & Benefits

Rapid & Reliable Installation

K-60 has a patented one-piece Wrapid Sleeve™ construction that incorporates a pre-attached closure strip as part of the sleeve. Because the closure has been factory applied, quick and reliable field installation is easy to accomplish. For added flexibility, CanusaWrap™ two-piece cut sleeves or bulk rolls are also available. K-60 is supplied with a yellow polyethylene backing for buried pipelines or a black backing with added UV resistance for above ground pipelines.






Long-Term Corrosion Protection

K-60 provides excellent resistance to cathodic disbondment resulting in effective long term corrosion protection. Once installed, K-60 provides the structural integrity of a seamless tube, and provides the substrate with durable protection against abrasion and chemical attack.

Saves Time & Money

K-60 can be supplied with a pre-attached closure or in bulk roll / cut sheet format with a separate closure. This versatility provides contractors choice and convenience depending on the type of project. For large projects, the unique construction of a pre-attached closure allows for quicker installation time versus handling, positioning and installing separate closures. For smaller projects or where multiple pipeline diameters are present, the convenience of bulk rolls or pre-cut sleeves with separate closures provides for maximum flexibility and minimizes inventory costs.

Applications

-  2LPE Pipeline Coatings
-  Fusion Bonded Epoxy
-  Pre-Insulated Pipes

Configurations

-  Wrapid Sleeve™
-  CanusaWrap™
-  2-Layer
-  Standard Shrink


Pipe Sizes

-  55 - 610 (2" - 24")

Temperature Range

-  Up to 60°C (140°F)

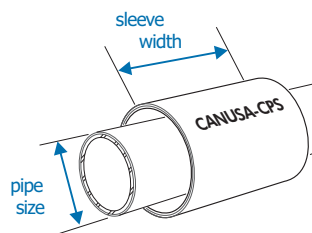
Product Selection Guide

Sleeve Operating Characteristics	Pipeline Operating Temperature Minimum Installation Temperature ■ °C (°F) Maximum Pipeline Operating Temperature ■ °C (°F) Resistance to Circumferential Forces Resistance to Soil Stress Resistance to Axial Pipe Movement Main Line Coating Compatibility	Celsius	Fahrenheit	Mastic Adhesive K-60  65 (149) 60 (140) good good good PE, PP, FBE, PU, Coal tar, Bitumen,
		110°	230°	
		90°	194°	
		70°	158°	
		50°	122°	
		30°	86°	

Typical Product Properties

Adhesive	Softening Point	ASTM E28	°C (°F)	87 (189)
	Lap Shear	ASTM D1002	N/cm ² (psi)	35 (51)
Backing	Specific Gravity	ASTM D792		.93
	Tensile Strength	ASTM D638	MPa (psi)	20 (2900)
	Elongation	ASTM D638	%	600
	Hardness	ASTM D2240	Shore D	46
	Abrasion Resistance	ASTM D1044	mg	45
	Volume Resistivity	ASTM D257	ohm-cm	10 ¹⁷
Sleeve	Dielectric Voltage Brkdown.	ASTM D149	kV/mm	20
	Impact	ASTM G14	J	10
	Indentation	ASTM G17	Holiday Test	pass @ 10 kV
	Peel Adhesion	ASTM D1000	N/cm (pli)	88 (50)
	Cathodic Disbondment	ASTM G8	mm rad	8
	Water Absorption	ASTM D570	%	0.05
Low Temp. Flexibility	ASTM D2671C	°C (°F)	-20 (-4)	

How To Order¹:

Dimensions & Ordering Info	K-60 230-450 YE		Standard Ordering Options		 Min. Sleeve Width = Bare Steel Dimension + 50 mm (2") min. on each side of the pipe joint.
	Colour	Sleeve Width	T Thickness	L Thickness	
	Pipe Size	Adhesive (min. thickness as supplied)	T	L	
	Backing (min. thickness as supplied)	Product Name	YE-Yellow, BK - Black		
			300mm, 450mm, 600mm, 900mm (12", 18", 24", 36")		
			55 - 610mm (2" - 24")		
			1.25 mm (50 mils)	1.7 mm (65 mils)	
			0.6 mm (25 mils)	0.9 mm (36 mils)	
		K-60			

The above represent standard Wrapid Sleeve™ ordering options. Consult your Canusa representative for any unique project requirements.

¹ For CanusaWrap™ bulk rolls, consult you Canusa representative. K-60 requires CLW closures.



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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

K-60 Wrapid Sleeve™

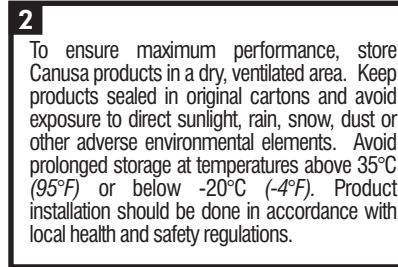
One-piece protective sleeve with pre-attached closure

Product Description



Canusa K-60 Wrapid Sleeves™ are shipped pre-cut with a pre-attached closure. The adhesive is protected from contamination by an inner release liner.

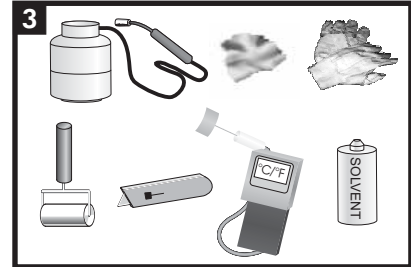
Storage & Safety Guidelines



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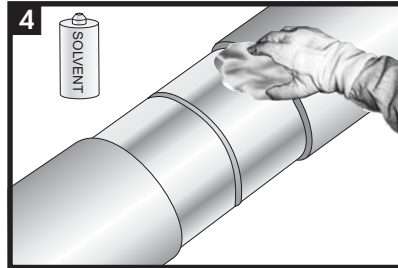
These installation instructions are intended as a guide for standard products. Consult your Canusa representative for specific projects or unique applications.

Equipment List

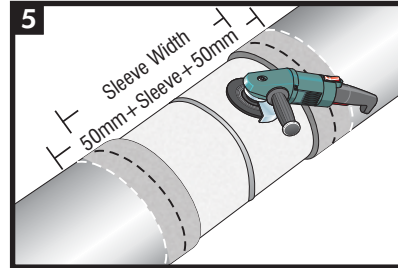


Propane tank, hose, torch & regulator
Appropriate tools for surface abrasion
Knife, roller, rags & approved solvent cleanser
Digital thermometer with suitable probe
Standard safety equipment; gloves, goggles, hard hat, etc.

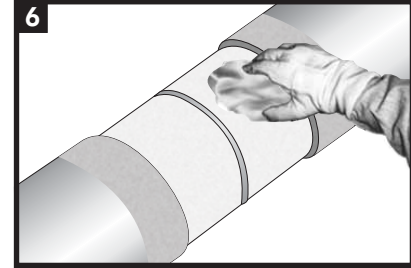
Surface Preparation



Ensure that the coating edges are beveled to at least 30°. Clean exposed steel and adjacent pipe coating with a solvent cleanser to remove the presence of oil, grease, and other contaminants, if present.

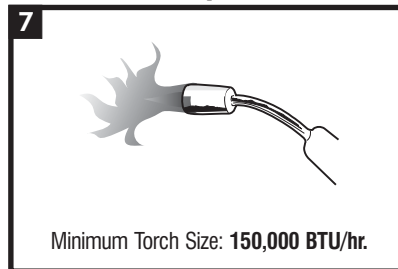


Ensure that the pipe is dry before cleaning. Using a hand or power wire brush, abrade the pipe to a minimum of St3/SP3. Lightly abrade the pipe coating adjacent to the cutback area to a distance of 50mm (2") beyond each end of the sleeve width.



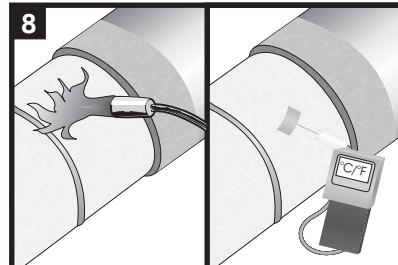
Wipe clean or air blast the steel and pipe coating to remove foreign contaminants.

Flame Intensity & Torch Size



Use **moderate** flame intensity for pre-heating and shrinking.

Pre-Heat

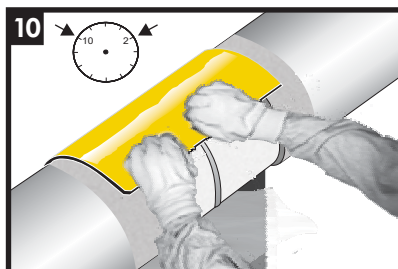


Pre-heat the joint area to the minimum of 65°C (150°F). Using a temperature measuring device, ensure that the correct temperature is reached on the steel and at least 50mm (2") on each side of the sleeve.

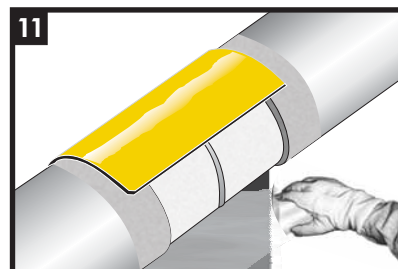
Sleeve Installation



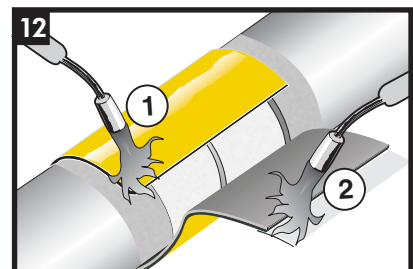
Partially remove the release liner and gently heat the underlap approximately 150 mm (6") from the edge.



Centre the sleeve over the joint so that the sleeve overlaps between the 10 and 2 o'clock positions. Press the underlap firmly into place.

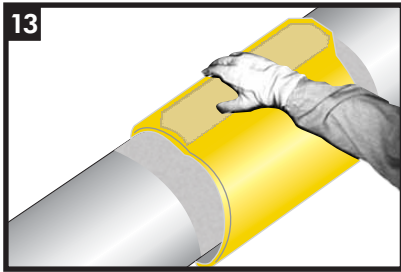


Remove the remaining release liner.

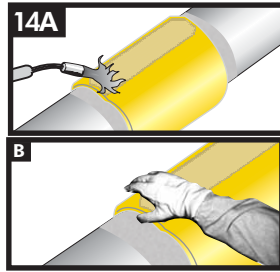


Wrap the sleeve loosely around the pipe, ensuring the appropriate overlap. Gently heat the backing of the underlap and the adhesive side of the overlap.

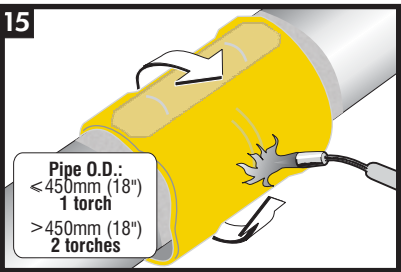
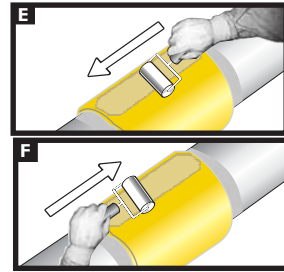
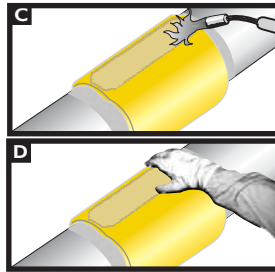
K-60 Wrapid Sleeve™



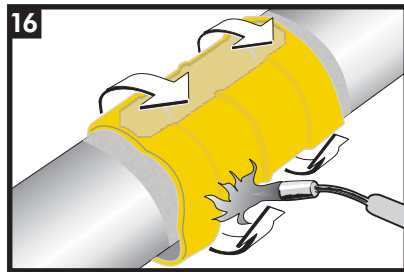
Press the closure firmly into place.



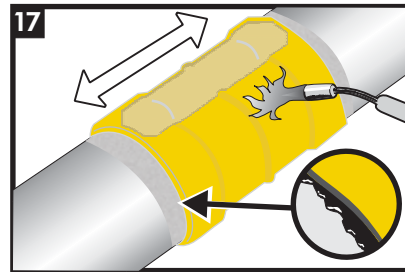
Gently heat the closure and pat it down with a gloved hand. Repeating this procedure, move from one side to the other. Smooth any wrinkles by gently working them outward from the centre of the closure with a roller.



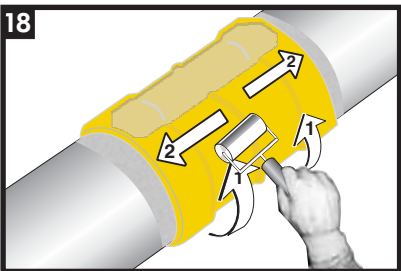
Using the appropriate torch, begin at the centre of the sleeve and heat circumferentially around the pipe. Use broad strokes. If utilizing two torches, operators should work on opposite sides of pipe.



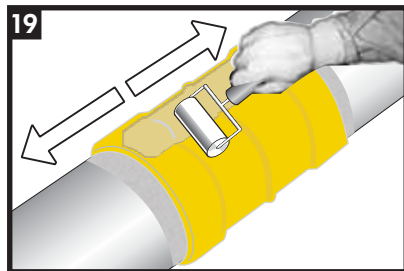
Continue heating from the centre toward one end of the sleeve until recovery is complete. In a similar manner, heat and shrink the remaining side.



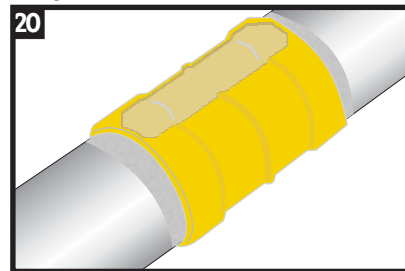
Shrinking has been completed when the adhesive begins to ooze at the sleeve edges all around the circumference. Finish shrinking the sleeve with long horizontal strokes over the entire surface to ensure a uniform bond.



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. If necessary, reheat to roll out air.



Continue the procedure by also firmly rolling the closure with long horizontal strokes from the weld outwards.



Inspection

Visually inspect the installed sleeve for the following:

- Sleeve is in full contact with the steel joint.
- Adhesive flows beyond both sleeve edges.
- No cracks or holes in sleeve backing.

Backfilling Guidelines

After shrinking is complete, allow the sleeve to cool for 2 hours prior to lowering and backfilling. To prevent damage to the sleeve, use selected backfill material, (no sharp stones or large particles) otherwise an extruded polyethylene mesh or other suitable shield should be used.



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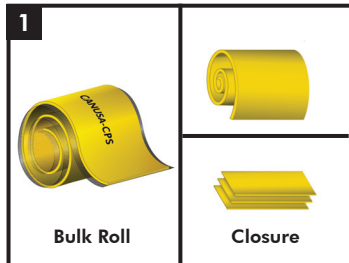
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K-60 CanusaWrap™

Two-piece protective bulk roll with separate closure

Product Description



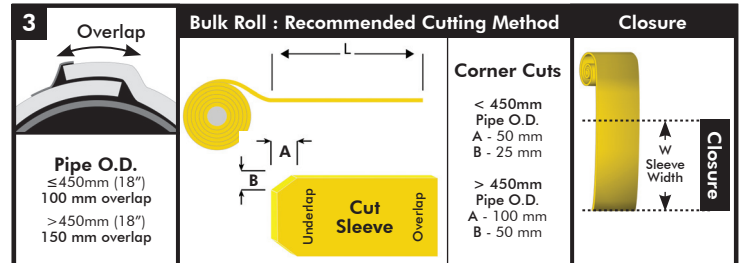
K-60 CanusaWrap™ is typically shipped in bulk rolls or as pre-cut sleeves. The adhesive is protected from contamination by an inner liner. Closures are shipped either in bulk rolls or pre-cut.

Equipment List



Propane tank, hose, torch & regulator, appropriate tools for surface abrasion, knife, roller, rags & approved solvent cleanser, digital thermometer with suitable probe, standard safety equipment; gloves, goggles, hard hat, etc.

Product Preparation Guidelines



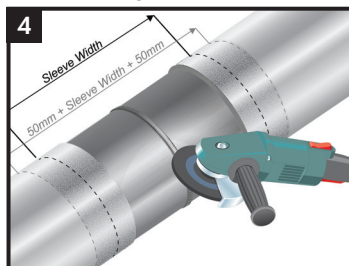
As a guideline, cut the required lengths of Sleeve material (L) and Closure material (W) from the bulk roll as follows

$$L = \text{Coated Pipe circumference} + \text{overlap dimension}$$

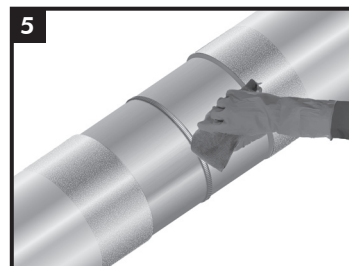
$$W = \text{Sleeve Width}$$

Ensure that the sleeve and closure are not damaged or contaminated. Trim corners as shown. Please see "CanusaWrap™ Sleeve Cutting Guidelines" for more information on alternative cutting methods.

Surface Preparation

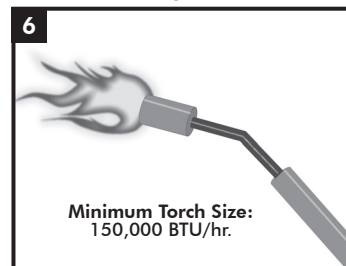


Ensure that the coating edges are beveled to at least 30°. Ensure that the pipe is dry before cleaning. Using a hand or power wire brush, abrade the pipe to a minimum of St3/SP3 (SA 2 1/2/SP10 is recommended). Lightly abrade the pipe coating adjacent to the cutback area to a distance of 50 mm (2") beyond each end of the sleeve width.



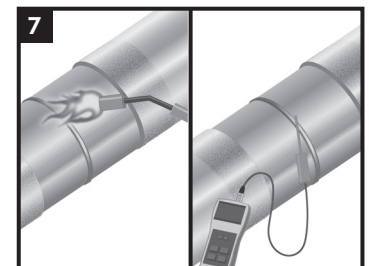
Wipe clean or air blast the steel and pipe coating to remove foreign contaminants.

Flame Intensity & Torch Size



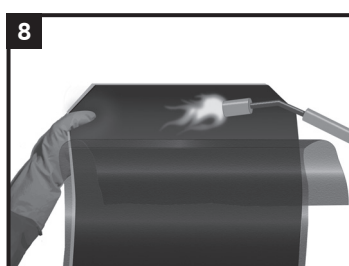
Use **moderate** flame intensity for pre-heating and shrinking.

Pre-Heat

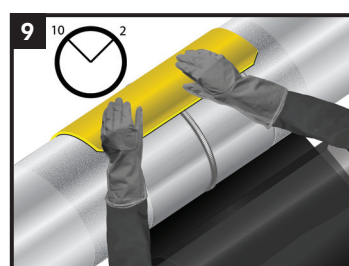


Pre-heat the joint area to the minimum of 65°C (150°F). Using a temperature measuring device, ensure that the correct temperature is reached on the steel and at least 50mm (2") on each side of the sleeve.

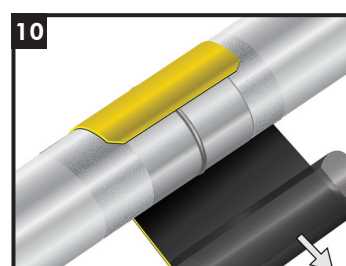
Sleeve Installation



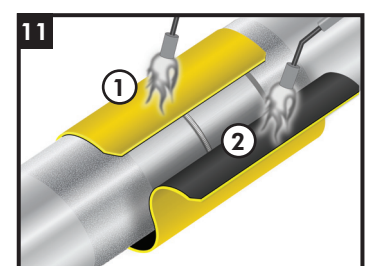
Partially remove the release liner and gently heat the underlap approximately 150 mm (6") from the edge.



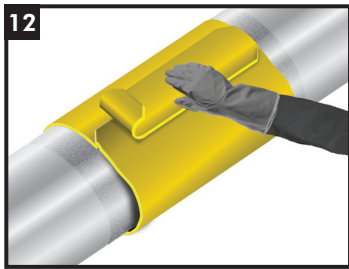
Centre the sleeve over the joint so that the sleeve overlaps between the 10 and 2 o'clock positions. Press the underlap firmly into place.



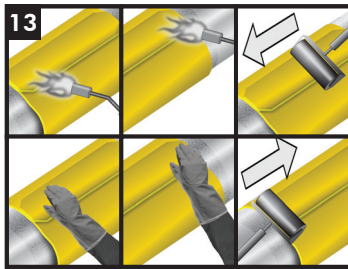
Remove the remaining release liner.



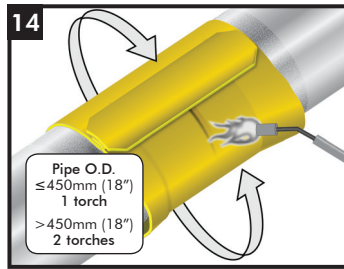
Wrap the sleeve loosely around the pipe, ensuring the appropriate overlap. Gently heat the backing of the underlap and the adhesive side of the overlap. Press the overlap into place.



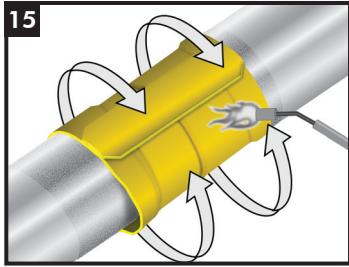
Centre the closure on the overlapping sleeve. Press down firmly.



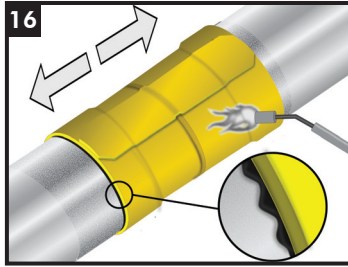
Gently heat the closure and pat it down with a gloved hand. Repeating this procedure, move from one side to the other. Smooth any wrinkles by gently working them outward from the centre of the closure with a roller.



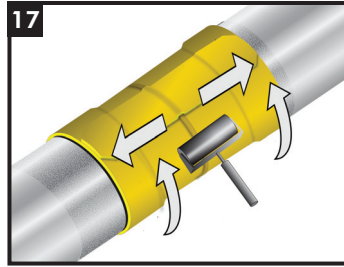
Using the appropriate sized torch, begin at the centre of the sleeve and heat circumferentially around the pipe. Use broad strokes. If utilizing two torches, operators should work on opposite sides of pipe.



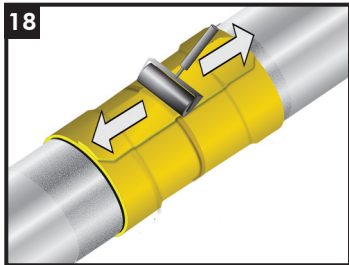
Continue heating from the centre toward one end of the sleeve until recovery is complete. In a similar manner, heat and shrink the remaining side.



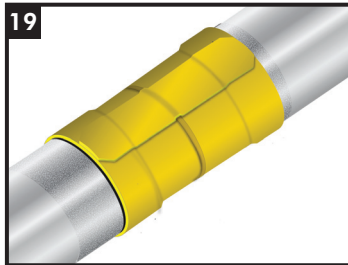
Shrinking has been completed when the adhesive begins to ooze at the sleeve edges all around the circumference. Finish shrinking the sleeve with long horizontal strokes over the entire surface to ensure a uniform bond.



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Continue the procedure by also firmly rolling the closure with long horizontal strokes from the weld outwards.



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- Adhesive flows beyond both sleeve edges.
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Inspection

Backfilling Guidelines

After shrinking is complete, allow the sleeve to cool for 2 hours prior to lowering and backfilling. To prevent damage to the sleeve, use selected backfill material, (no sharp stones or large particles) otherwise an extruded polyethylene mesh or other suitable shield should be used.

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Part No. 99060-190

IG_K-60 (CanusaWrap)_rev014