

# CLOCK SPRING®

## INSTALLATION GUIDE AND CHECKLIST

03/22/05

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**2.0 CLOCK SPRING® REPAIR INFORMATION**

2.1 Record the following general data:

Date: \_\_\_\_\_  
Repair Identification Number (Optional): \_\_\_\_\_  
Clock Spring® Serial Number \_\_\_\_\_  
Adhesive Batch Number: \_\_\_\_\_  
Adhesive Activator Batch Number (Blue): \_\_\_\_\_  
Expiry Date: \_\_\_\_\_  
Filler Batch Number: \_\_\_\_\_  
Filler Activator Batch Number (Salmon): \_\_\_\_\_  
Expiry Date: \_\_\_\_\_  
Pipe temperature: \_\_\_\_\_  
Ambient temperature: \_\_\_\_\_

2.2 Record the following pipeline data:

Location: \_\_\_\_\_  
Pipe diameter: \_\_\_\_\_  
Wall thickness: \_\_\_\_\_  
Pipe grade: \_\_\_\_\_  
Pipe type: \_\_\_\_\_  
(ERW, DSAW, EFW, Seamless, Etc.)  
Operating pressure: \_\_\_\_\_  
Installation pressure \_\_\_\_\_  
Coating type: \_\_\_\_\_

2.3 Record the following defect information:

Defect Type: \_\_\_\_\_  
Defect length: \_\_\_\_\_  
Defect width: \_\_\_\_\_  
Defect depth: \_\_\_\_\_

2.4 Answer the following questions:

Are adhesive, filler and activators within expiry date?	Yes	No
Is the defect appropriate for Clock Spring® repair?	Yes	No
Is the defect blunt?	Yes	No
Was the defect assessed with GRIWrap or equivalent?	Yes	No
Is Clock Spring® an acceptable repair?	Yes	No
Is this a typical repair?	Yes	No
Is the surface preparation equivalent to NACE #3?	Yes	No
Did the adhesive cure?	Yes	No
Was the repair coated?	Yes	No

If the answer to any of the above questions is "No" and your training did not cover the condition refer to the Clock Spring® Installation Manual or contact Clock Spring Company, L.P. for assistance.

Note: If the defect being repaired was first ground from the pipe the area should be inspected for cracks with an appropriate NDE technique.

### 3.0 **INSTALLATION PROCEDURE FOR CLOCK SPRING® COIL**

This procedure is to be used as a guideline by certified Installers and Trainers for standard Clock Spring® installations. If questions or concerns arise, that are not clearly answered in this guide contact Clock Spring Company, L.P. for detailed information and instruction.

- 3.1 Characterize the defect to determine if Clock Spring® is a suitable repair using GRIWrap™ or an equivalent method. Record defect information. The length of the defect will determine the number of Clock Spring® units needed for the repair. Clock Spring® units are nominally 11.5-inches (292 mm) wide and must overlap the defect by 2-inches (51 mm) on each side. Multiple units can be used side-by-side to repair longer defects.
- 3.2 Table 1 outlines items provided in the Clock Spring® kit and items to be provided by the Installer. Verify that all necessary items are available.

<b>Clock Spring® Kit</b>	<b>Installer Supplied Tools</b>
Clock Spring® Sleeve	Safety Glasses
Starter Pad	Thermometer
Filler and Activator	Tarp or Covering (as necessary)
Adhesive and Activator	Thermal Pipe Wrap (as Necessary)
3-inch (76 mm) Putty Knife	Marker
Jiffy Mixer	Measuring Tape
Roller Handle and Sleeve	Electric Drill (Battery)
2-inch (51 mm) Brush (Qty. 2)	1-Pound (.45 kg) Rubber Mallet
Razor Knife	Shore A Hardness Tester
Adhesive Tray	MEK or Acetone Solvent
Wooden Alignment Blocks	Rags
Adhesive Spatula	3M Adhesive
Dual Lock Tight Pad	
Trash Bag	
1-inch (25 mm) Filament Tape	

**Table 1**

- 3.3 Prepare pipe surface for repair by removing any pipe coating, corrosion residue, primer or adhesive, allowing 4 – 6-inches (102 – 152 mm) of prepared pipe on each side of the area to be sleeved. The pipe surface should conform to NACE # 3 standards or equivalent. Wipe the repair area with MEK or Acetone.
- 3.4 Dry apply 2 – 3 wraps of Clock Spring® sleeve around the defect area for “marking” purposes. An alternative is to use any item (i.e. pipe wrap, plastic strip, etc.), which will conform to the pipe.) Center the Clock Spring® over the repair ensuring a 2-inch (51 mm) overlap on each side of the defect. Mark the edge of the Clock Spring®. This reference mark will be used later in the procedure.
- 3.5 Remove the Clock Spring® dry wrap and attach the starter pad. Center the starter pad within the “marked” repair area about 4 – 6-inches (102 – 152 mm) from the primary defect area with the “easy peel” side towards the ground.
- 3.6 Obtain and record the ambient and pipe surface temperatures. If the pipe temperature is less than 32°F (0°C) or greater than 100°F (33°C), contact the Clock Spring Company, L.P. or their representative for special instructions. Use the highest temperature obtained to determine appropriate ratio of activator needed for filler and adhesive. Refer to the chart on the Adhesive container or Filler tube for the proper mix ratio. Tables 2 and 3 are provided here for reference only. If the information in these tables is at variance with the mix ratio charts on the Adhesive container or Filler tube, those ratios will take precedent. Thoroughly mix the adhesive with the blue colored activator and the filler with the orange

colored activator until both mixtures are uniform in color and without streaks. Mix for approximately 2 – 3 minutes. Note that the working time has begun once the activator is mixed. (Note: For adhesive quantity vs size see Table 4, last page)

Installation Temperature		Activator Quantity (grams)						Approximate	
		Adhesive Quantity (grams)						Working Time (minutes)	Cure Time (hours)
°C	°F	650	1200	1700	2400	3000	3300		
0	32	80	150	220	300	380	400	45	2.5 – 3
10	50	70	140	180	260	330	370	45	2.5 – 3
21	70	65	120	170	240	300	330	45	2.5 – 3
27	80	55	100	150	200	240	280	45	2 – 3
32	90	50	90	130	170	200	240	35	2 – 2.5
38	100	45	85	110	160	190	200	20	1.5 – 2
43	110	40	75	100	150	180	190	18	1 – 1.5
49	120	40	70	100	140	170	185	18	0.5 – 1

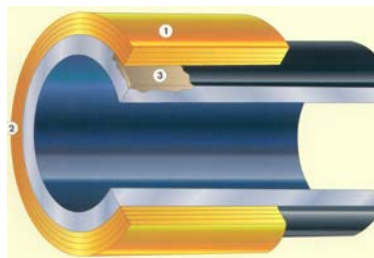
**Table 2**  
Activator Quantity for Adhesive

Temperature		Activator Qty. Grams	Working Time Minutes
°F	°C		
10 – 30	-12 – 0	40	60
30 – 50	0 – 10	30	60
50 – 64	10 – 17	20	45
65 – 74	18 – 23	15	45
75 – 89	24 – 31	10	35
90 – 120	32 – 49	5	20

**Table 3**  
Activator Quantity for Filler (450 g)

- 3.7 Using the 3-inch (76 mm) putty knife, apply filler to all voids, both edges of the longitudinal weld and on one edge of the starter pad (for the leading edge placement of the Clock Spring®). Ensure sufficient filler is applied to provide intimate contact between the prepared pipe surface and the Clock Spring® sleeve to be installed.
- 3.8 Pour mixed adhesive into the application tray and, using the roller handle and roller sleeve, apply the adhesive to the entire pipe surface to be repaired, including the starter pad and filler material.
- 3.9 Remove the parting film (backing) from the starter pad and secure the leading edge of the Clock Spring® sleeve to the pad. Tap the composite sleeve onto the starter pad and ensure that it is anchored firmly to the pipe. Check that the sides of the Clock Spring® are 90° to the pipe axis and aligned with the reference mark created in Section 3.4.
- 3.10 Ensure sufficient filler material is applied to the area where the leading edge of the Clock Spring® will be positioned. Filler is required to ensure intimate contact at the point where the first layer of the clock Spring® overlays the second layer.
- 3.11 Apply Adhesive to the Clock Spring® outer-surface while wrapping the unit around the pipe.
- 3.12 Continue applying adhesive and wrapping the Clock Spring® around the pipe until the “second black identifying line” appears. There are two identifying lines “marked” on the final wraps of the Clock Spring® sleeve. The first line is to alert the Installer that the application of the adhesive is nearing completion. The second line indicates the stopping point of the adhesive application. Apply adhesive 1-inch (25 mm) beyond this point.

- 3.13 Carefully position the remaining portion of the Clock Spring® around the pipe and assist the “memory matrix” to tighten the sleeve onto the pipe. Align the edges of the installed sleeve using the wooden blocks and a hammer.
- 3.14 Prepare to tighten the Clock Spring® sleeve by centering the dual lock pad 6 – 12-inches (152 – 305 mm) from the trailing edge of the Clock Spring®.
- 3.15 Secure the cinch bar strap to the dual lock. Position the cinch bar and apply steady pressure (approximately 80 – 100 ft. lbs. (11 – 14 Kg m). Hold for about one minute until excess material extrudes from the edges of the Clock Spring®.
- 3.16 While maintaining steady pressure, secure the Clock Spring® in position by wrapping filament tape around the sleeve at least three times, approximately 1-inch (25 mm) from each edge.
- 3.17 Perform final alignment of the Clock Spring® sleeve with the wooden blocks.
- 3.18 Remove the extruded filler material from both edges of the sleeve using the 3-inch (76 mm) putty knife. Visually inspect the installation to ensure all wraps are tight and fit snugly to the pipe around the entire circumference. Voids or spaces between the wraps, or between the Clock Spring® and the pipe, will render the repair ineffective.
- 3.19 Seal both edges and trailing edge of the sleeve with the remaining adhesive using the paintbrushes.
- 3.20 Ensure that all edges and seams have been sufficiently coated with adhesive. Full cure should occur in approximately 2 hours. To verify that the adhesive is cured, check for a minimum hardness of 40 on the Shore A scale. The completed Clock Spring® assembly is to be treated as a standard pipe repair requiring an external coating. The Clock Spring® is U-V sensitive. Pipe coatings for aboveground pipe must be opaque.
- 3.21 It is valuable for a pipeline operator to be able to detect prior repairs on subsequent in-line-inspections so that time is not spent determining the disposition of a defect detected and repaired during a previous program. The older more traditional repairs are identifiable in the magnetic flux leakage inspection tool data but the Clock Spring® composite repairs are invisible to this technology. The Clock Spring® repair can be fitted with a metallic band to allow detection by Magnetic Flux Leakage inspection tools.
- 3.22 Clock Spring® will not affect the defect signals recorded by an MFL inspection tool. Defects repaired with Clock Spring® and identified in the inspection tool data by the banding method (3.21) can be used on subsequent inspections to calibrate the tool or qualify the inspection.



**Simply the smartest pipeline repair decision you can make!**

Pipe Size (inches)	Adhesive Quantity (grams)	Pipe Size (inches)	Adhesive Quantity (grams)	Pipe Size (inches)	Adhesive Quantity (grams)
4	650	18	1700	32	3300
6	650	20	2400	36	3300
8	1200	22	2400	40	4800
10	1200	24	2400	42	4800
12	1200	26	3000	44	4800
14	1700	28	3000	48	4800
16	1700	30	3300	56	6000

**Table 4**  
Adhesive Quantity vs Clock Spring® Size

Notes:

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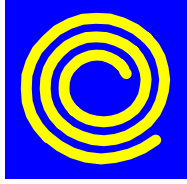
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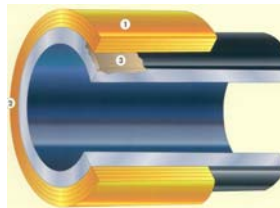
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