

נספח ב' : הוראות תיקון קורוזיה חיצונית ע"י עטיפה תוצרת חברת CLOCK SPRING

4.0 **INSTALLATION PROCEDURE FOR CLOCK SPRING® COIL PASS METHOD**

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 Manual or Appendices, contact [Clock Spring Company, L.P.](#) for detailed information and instruction.

- 4.1 Characterize the defect to determine if Clock Spring® is a suitable repair using GRIWrap™ or an equivalent method. See [Appendix B](#) for more information. The length of the defect will determine the number of Clock Spring® units needed for the repair. Clock Springs are nominally 11.5-inches (292 mm) wide and must overlap the defect by 2-inches (51 mm) on each side (Figure 1). Multiple units can be used side-by-side to repair longer defects ([Appendix Q](#)).



Figure 1

- 4.2 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.

Clock Spring® Kit	Installer Supplied Tools
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	Cinch Bar and Strap
Trash Bag	Spool Feeder
1-inch (25 mm) Filament Tape	

Table 1.

- 4.3 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 (Figure 2). The pipe surface should conform to NACE # 3 standards or equivalent. Wipe the repair area with



MEK or Acetone. More surface preparation information is contained in [Appendix D](#).

If condensation exists on the pipe surface, refer to [Appendix E](#).

For severe weather conditions refer to [Appendix F](#).



Figure 2

- 4.4 Dry apply 2 – 3 wraps of Clock Spring® sleeve around the defect area for “marking” purposes (Figure 3). (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.



Figure 3

- 4.5 Remove the Clock Spring® dry wrap and attach the starter pad (Figure 4). 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. If condensation exists on the pipe surface refer to [Appendix E](#). For severe weather conditions refer to [Appendix F](#). For deformation defects or extensive cluster corrosion, refer to [Appendix G](#) for single wrap mold instructions.



Figure 4

- 4.6 Obtain the ambient and pipe surface temperatures (Figure 5). 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. 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 (Figures 6 and 7). Mix for approximately 2 – 3 minutes. Note that the working time has begun once the activator is mixed. [Appendix H](#) contains additional detailed mixing instructions.

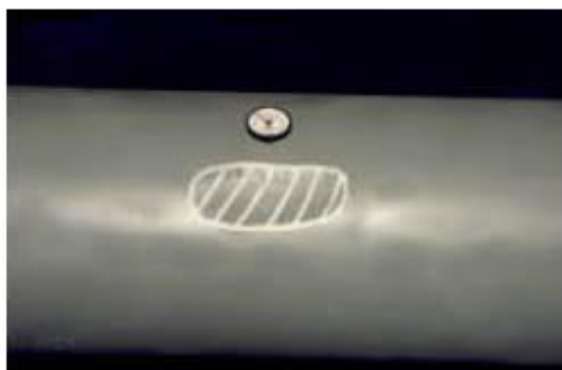


Figure 5

[Appendix I](#) contains additional information on the cleanup and disposal of Adhesive, Filler and Activators. [Appendix C](#) details the storage requirements for these materials.



Figure 6



Figure 7

- 4.7 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® (Figure 8). Ensure sufficient filler is applied to provide intimate contact between the prepared pipe surface and the Clock Spring® sleeve to be installed.



Figure 8

- 4.8 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 (Figure 9).



Figure 9

- 4.9 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 (Figure 10). Check that the sides of the Clock Spring® are 90° to the pipe axis and aligned with the reference mark created in Section 4.4.



Figure 10

- 4.10 Ensure sufficient filler material is applied to the area where the leading edge of the Clock Spring® will be positioned (Figure 11). Filler is required to ensure intimate contact at the point where the first layer of the Clock Spring® overlays the second layer.

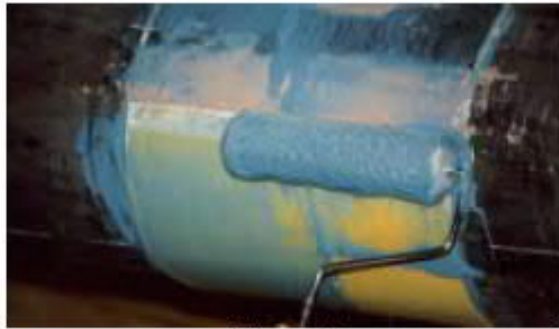


Figure 11

- 4.11 Apply adhesive to the Clock Spring® outer-surface while wrapping the unit around the pipe (Figure 12).



Figure 12

- 4.12 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 (Figure 13).



Figure 13

- 4.13 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 (Figure 14).

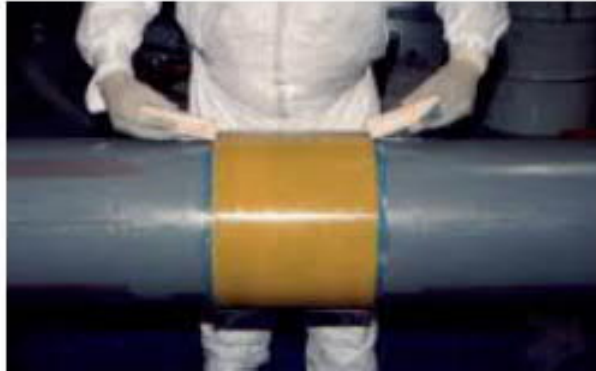


Figure 14

- 4.14 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® (Figure 15).



Figure 15

- 4.15 Secure the cinch bar strap to the dual lock (Figure 16). 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® (Figure 17).



אגף הנדסה



Figure 16



Figure 17

- 4.16 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 (Figure 18).



Figure 18



- 4.17 Perform final alignment of the Clock Spring® sleeve with the wooden blocks (Figure 19).



Figure 19

- 4.18 Remove the extruded filler material from both edges of the sleeve using the 3-inch (76 mm) putty knife (Figure 20).



Figure 20

- 4.19 Seal both edges and trailing edge of the sleeve with the remaining adhesive using the paintbrushes (Figure 21).





Figure 21

- 4.20 Ensure that all edges and seams have been sufficiently coated with adhesive (Figure 22). 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.



Figure 22

- 4.21 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. This procedure is outlined in [Appendix P](#).

Simply the smartest pipeline repair decision you can make!