

APPLICATION OF UNDERWATER REPAIR COATINGS FOR LINE 5 STRAITS

Version #: 3.0

Version Date: May 15, 2018

This page intentionally left blank

Table of Contents

1.0 Scope 2

2.0 General 2

2.1 Manufacturer Support 2

2.2 Operator Qualifications and Training 2

2.3 Pipe Excavation 2

2.4 Deviations 2

3.0 Surface Preparation 3

3.1 Pre-Preparation 3

3.2 Parent Coating 4

4.0 Coating Application 4

4.1 Surface Condition for Coating 4

4.2 Preparation and Application of the Epoxy Filler 4

4.3 Preparation and Application of Full Circumferential Wrap Repairs (Method 1) 5

4.4 Preparation and Application of Composite Repairs (Method 2) 6

4.5 Cure Time 6

5.0 Quality Control 7

5.1 Diver 7

5.2 Company Inspector 7

1.0 Scope

This procedure defines the requirements for application of repair coatings to pipe previously coated with coal tar enamel (parent coating) that are located underwater (e.g., lake bottom, straits crossing). Coating repairs consist of the following approved methods that include:

- Method 1 – Epoxy Filler/ Full Circumferential Composite Wrap Repair/Release Film
- Method 2 – Epoxy Filler/ Composite Patch Repair/Release Film
- Method 3 – Epoxy Filler/ Release Film

2.0 General

2.1 Manufacturer Support

This procedure was developed with support of the product Manufacturers. The Manufacturer's instructions and technical datasheet form an integral part of this procedure and have been incorporated herein.

2.2 Operator Qualifications and Training

Any contractor that is performing an OQ task is required to complete training modules and hands-on training to demonstrate qualifications. This training process is designed to deliver the basic skills required for each task. After completion of the OQ training, the results are uploaded to ISNET to verify compliance.

To supplement the OQ certification process, the coating manufacturer shall perform specific training for the materials and coating applications that will be used for the L5 Straits underwater coating repairs. Upon successful completion of the manufacturer's training, the Manufacturer shall issue a certificate of training or other documentation that supports the competency of the individual divers with application of the product.

Note: At its discretion, the coating Manufacturer may designate in writing a representative to conduct this training on its behalf.

2.3 Pipe Excavation

If pipe is buried in the lake floor, full circumferential access at the repair area may be accomplished by water blasting or other appropriate excavation methods to allow the circumferential application of the composite wrap and/or the release film.

2.4 Deviations

Any deviations from this procedure shall be brought to the Pipeline Integrity (PI) Coatings Specialist for resolution. The PI Coatings Specialist will consult with the key stakeholders that include, but are not limited to, the onsite Company Inspector, the Diver, and the coating Manufacturer. If the deviation is accepted, the requested deviation, key stakeholder inputs and

risk assessment associated with the deviation will be uploaded into the Company's Business Information Management (BIM) system.

Note: No deviations will be accepted if they are not supported by the coating Manufacturer.

3.0 Approved Materials

The list of company approved products is shown in Table 1.

Table 1. Company Approved Product by Method and Manufacturer

Method	Manufacturer	Lowest Application Temperature (°F)	Epoxy Filler	Composite Epoxy/Wrap	Release Film
1	PRTI	40	BIO-DUR™ 563 SW	X-100/E-Glass	Stricture Banding™
2	PRTI	40	BIO-DUR™ 563 SW	X-100/E-Glass	Stricture Banding™
3	Belzona	38	Belzona 1161	N/A	Belzona 9382

4.0 Surface Preparation

4.1 Pre-Preparation

4.1.1

The steel surface shall be cleaned using scarpers, hydroblasting cleaning, wet abrasive blasting, and/or power wire wheel brush.

4.1.2

The repair area shall be abraded to bare metal using wet abrasive blasting, power wire wheel brush, and/or hand tools that are capable of providing a surface profile of 2.5 – 5 mils.

4.1.3

The surface profile shall be measured using replica tape and shall meet the surface profile requirements of 4.1.2.

4.2 Parent Coating

4.2.1

Feathering shall remove the sharp edge at the transition from the parent coating.

4.2.2

The parent coating shall be roughened (abraded) using a wire brush, cup brush, wheel brush, and/or scouring pads to remove the loosely adherent biota, coating and provide a surface for transition.

4.2.3

For full circumferential composite wrap repairs (Method 1), the roughening shall extend at least 6 inches from the upstream and downstream edge of the repair area and around the entire circumference of the pipe.

For composite patch repairs (Method 2), the roughening shall extend onto the parent coating at least 6 inches from the edge of the repair area.

For epoxy only repairs (Method 3), the roughening shall extend onto the parent coating at least 2 inches from the edge of the repair area.

5.0 Coating Application

5.1 Surface Condition for Coating

Immediately prior to coating application, the Diver shall remove any flash rust and/or accumulated debris (silt, clay, etc.) using a wire brush or other method approved by the Manufacturer.

Note: The surface of the pipe shall meet all preparation requirements listed in Section 4.0 before the coating application.

5.2 Preparation and Application of the Epoxy Filler

5.2.1

The epoxy filler shall be prepared by thoroughly mixing the appropriate ratio of base and hardener as per the Manufacturer's written procedures.

5.2.2

The diver shall apply the epoxy using a gloved hand or other method approved by the Manufacturer so that the bare steel is completely covered and the repair area is flush with the adjacent parent coating.

5.2.3

The diver shall confirm that the thickness of the epoxy filler is sufficient using a straight edge tool that bridges the adjacent parent coating on each side of the repair. If the epoxy filler is below the straight edge tool, additional filler shall be added to ensure the repair area is at least flush with the adjacent parent coating.

5.3 Preparation and Application of Full Circumferential Wrap Repairs (Method 1)

5.3.1

The composite epoxy shall be prepared by thoroughly mixing the base and the hardener as per the Manufacturer's written procedures.

5.3.2

The composite fabric is supplied in rolls. The rolls shall be cut into approximately 12 feet long strips and impregnated with the composite epoxy to form the composite wraps.

5.3.3

Prior to application of the composite wrap, the composite epoxy shall be hand applied to the surface of the abraded adjacent parent coating. If the epoxy filler is sufficiently setup to resist movement, composite epoxy shall also be applied over the epoxy filler.

5.3.4

The composite wrap shall be applied 360 degrees around the pipe to a minimum thickness of 4 full layers and shall extend over the epoxy filler and abraded adjacent parent coating. Wider repairs will require additional side by side layups that are each 12 inches wide with a minimum two inch overlap at the seams.

5.3.5

Release film will be tightly applied in the same direction as the composite wrap to a minimum of three (3) layers to assure the radial compression and retention of the repair in place during cure.

Note: alternative protective wraps or encasements are allowed if approved by the coating Manufacturer.

5.3.6

The release film shall extend at least 4 inches upstream and downstream of the repair.

Note: the release film is applied in the same direction of the composite wrap and shall have tension in order to secure the composite wrap.

5.4 Preparation and Application of Composite Repairs (Method 2)

5.4.1

The composite epoxy shall be prepared by thoroughly mixing the base and the hardener as per the Manufacturer's written procedures.

5.4.2

The composite fabric shall be cut sufficiently large enough to cover the repair area. An individual patch shall not exceed approximately 24 inch x 24 inch. The composite fabric shall be impregnated with the composite epoxy to form the composite patch.

5.4.3

Prior to application of the composite patch, the composite epoxy shall be hand applied to the surface of the abraded adjacent parent coating. If the epoxy filler is sufficiently setup to resist movement, composite epoxy shall also be applied over the epoxy filler.

5.4.4

Composite patch repairs shall consist of a minimum of 4 layers of the patch applied directly over the epoxy filler and abraded adjacent parent coating. The patches shall be applied in 4 layer patches until the entire repair area (filler and abraded adjacent parent coating) is coated. A minimum two inch overlap at the seams is required between patches.

5.4.5

Release film will be tightly applied 360 degrees around the pipe over the composite patch repairs to a minimum of three (3) layers to assure the radial compression and retention of the repair in place during cure.

Note: alternative protective wraps or encasements are allowed if approved by the coating Manufacturer.

5.4.6

The release film shall extend at least 4 inches upstream and downstream of the edge of the coating repairs.

5.5 Application of Release Film (Method 3)

5.5.1

After the application of the epoxy filler in Section 5.2, release film will be tightly applied 360 degrees around the pipe over the epoxy filler to a minimum of three (3) layers to assure the radial compression and retention of the repair in place during cure.

Note: alternative protective wraps or encasements are allowed if approved by the coating Manufacturer.

5.5.2

The release film shall extend at least 2 inches upstream and downstream of the edge of the coating repairs.

5.1 Cure Time

5.1.1

After application, the coating system will be allowed to cure.

5.1.2

The diver shall record a sufficient number of hardness measurements to determine cure. The release film shall be removed when the average Shore D hardness reaches a value of 70 or higher.

6.0 Quality Control

6.1 Diver

The Diver shall be responsible for the quality of the coating repair work.

6.2 Company Inspector

6.2.1

The Company Inspector shall have access to and shall be allowed to witness or audit the Diver's work, equipment, and records.

6.2.2

The competency requirements for the Company Inspector are as follows:

a) Minimum NACE-certified CIP Level 2 (or equivalent certification such as SSPC)
b) Trained and knowledgeable with regard to the application techniques, materials, and product data sheets covered by this specification

6.2.3

The Company Inspector reserves the right to stop any or all work at any time for non-compliance with the stated requirements of this procedure, during emergency situations, or for other justifiable reasons.