

## Ship 2 Shore

7337 N Fraser Way #109, Burnaby, BC V5J 0G7

### CATHODIC DISBONDMENT TEST

**OF 9170 PETROWRAP TAPE WITH PRIMER: PLID PRIMER, PLID WRAP  
AS PER ASTM G8 METHOD B**

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0881-19-01-2 Rev0

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## SUMMARY OF RESULTS

Table 1. Cathodic Disbondment Test of 9170 PetroWrap Tape with Primer: PLID PRIMER, PLID WRAP  
as per ASTM G8-96 (2010) Method B

Test Method	Test Conditions	Acceptance Criteria	Sample ID	Test Results
<p style="text-align: center;"><b>Cathodic Disbondment</b></p> <p style="text-align: center;">ASTM G8-96 (2010) Method B</p>	<p><i>Intentional Holiday:</i> 6.4 mm in diameter</p> <p><i>Temperature:</i> 25±3°C</p> <p><i>Electrolyte:</i> 1% NaCl, 1% Na<sub>2</sub>SO<sub>4</sub>, and 1% Na<sub>2</sub>CO<sub>3</sub> solution</p> <p><i>Impressed Voltage:</i> -1.39 V to a saturated Ag/AgCl electrode (-1.5 V with respect to Cu/CuSO<sub>4</sub> reference electrode)</p> <p><i>Duration:</i> 30 days</p>	Report results	CD3	<ul style="list-style-type: none"> <li>➤ No coating disbondment but cohesive failure of the coating system was noted around the intentional and reference holidays.</li> <li>➤ The equivalent circle diameter (ECD) was zero.</li> </ul>

## **INTRODUCTION**

At the request of Ship 2 Shore Ltd. conducted cathodic disbondment tests for 9170 PetroWrap Tape with primer: PLID PRIMER, PLID WRAP as per ASTM G8-96 (2010) Method B. S2S provided one pipe ring for testing. According to the information provided by S2S, the coating system PLID PRIMER, PLID WRAP was provided by Ship-2-Shore in Burnaby, BC, Canada.

## **OBJECTIVE**

The objective of this test was to evaluate the cathodic disbondment resistance of the 9170 PetroWrap Tape with primer: PLID PRIMER, PLID WRAP in accordance with ASTM G8-96 (2010) Method B.

## **SCOPE**

The scope of this project was as follows:

1. S2S Inc supplied one pipe ring for the coating system PLID PRIMER, PLID WRAP.
2. IS2S Inc specified the test conditions.
3. Charter Coating Service (2000) Ltd. sealed one end of each pipe sample with cap and 9170 PetroWrap Tape PLID WRAP.
4. Charter Coating Service (2000) Ltd. conducted the test and evaluated the test results as per ASTM G8-96 (2010) Method B.

## **CATHODIC DISBONDMENT**

Cathodic protection is a technique used to reduce the corrosion of a metal surface by providing it with enough cathodic current to make its anodic dissolution rate become negligible. This technique can be detrimental to the performance of the coating applied. The cathodic disbondment test, conducted in the laboratory, simulates the cathodic protection (CP) system used in the field while providing an indication of the durability of the coating material under the provided voltage conditions. An aggressive, caustic environment at the substrate/coating interface develops on the edge of the holiday (the cathode) as a result of the impressed electrical stress. Coating disbondment is initiated and propagates around the holiday due to the increase in pH in the immediate environment. The amount of coating disbondment is recorded and based on this disbondment; the coating material is then rated for its durability under the test conditions.

The objective of this study was to evaluate the cathodic disbondment resistance of the 9170 PetroWrap Tape with primer: PLID PRIMER, PLID WRAP under conditions of an impressed current simulating cathodic protection at  $25\pm 3^{\circ}\text{C}$ .

## **CONCLUSIONS**

The 9170 PetroWrap Tape with primer: PLID PRIMER, PLID WRAP showed resistance to the cathodic disbondment testing conditions at  $25^{\circ}\text{C}/77^{\circ}\text{F}$  for thirty (30) days and the equivalent circle diameter (ECD) was zero.

## METHODOLOGY

The cathodic disbondment (CD) test was conducted according to ASTM G8-96 (2010) Method B. The test specimen consists of one (1) OD 4.5" × 11" pipe ring applied with primer and then wrapped with 9170 PetroWrap Tape. One end of each pipe was mounted with cap and sealed with 9170 PetroWrap Tape. Prior to making the artificial holiday, the continuity of the coating and the effectiveness of the end-cap seal were verified. One intentional holiday with a diameter of 6.4 mm was drilled in the center of the immersed test length. The test specimen was suspended vertically in the bath with the sealed end 6" away from the bottom of the test vessel, and more than 1.5" away from the anode and the wall of the bath. Electrolyte was added until about 8" of the sample lengths was submerged.

The test conditions were as follows:

Temperature:	25±3°C
Electrolyte:	1% NaCl, 1% NaSO <sub>4</sub> and 1% Na <sub>2</sub> CO <sub>3</sub> solution
Test duration:	30 days
Impressed voltage:	-1.39 VDC with respect to saturated Ag/AgCl electrode (-1.5 V with respect to Cu/CuSO <sub>4</sub> reference electrode)

At the completion of the test, the specimen was disconnected from the cathodic protection circuit and removed from the test solution. A new reference holiday was drilled where was not immersed. Radial 45° cuts were made through the coating to the substrate intersecting at the center of both intentional and reference holidays on the test specimen. The coating was lifted from the substrate by placing the tip of the blade of a utility knife in the cut lines at the holiday and using a levering action to pry the coating off the metal. Eight measurements of radius of disbondment were then taken for each holiday and the equivalent circle diameter (ECD) was calculated.

## RESULTS

Results obtained are shown in Figure 1 below and given in the attached data sheet.

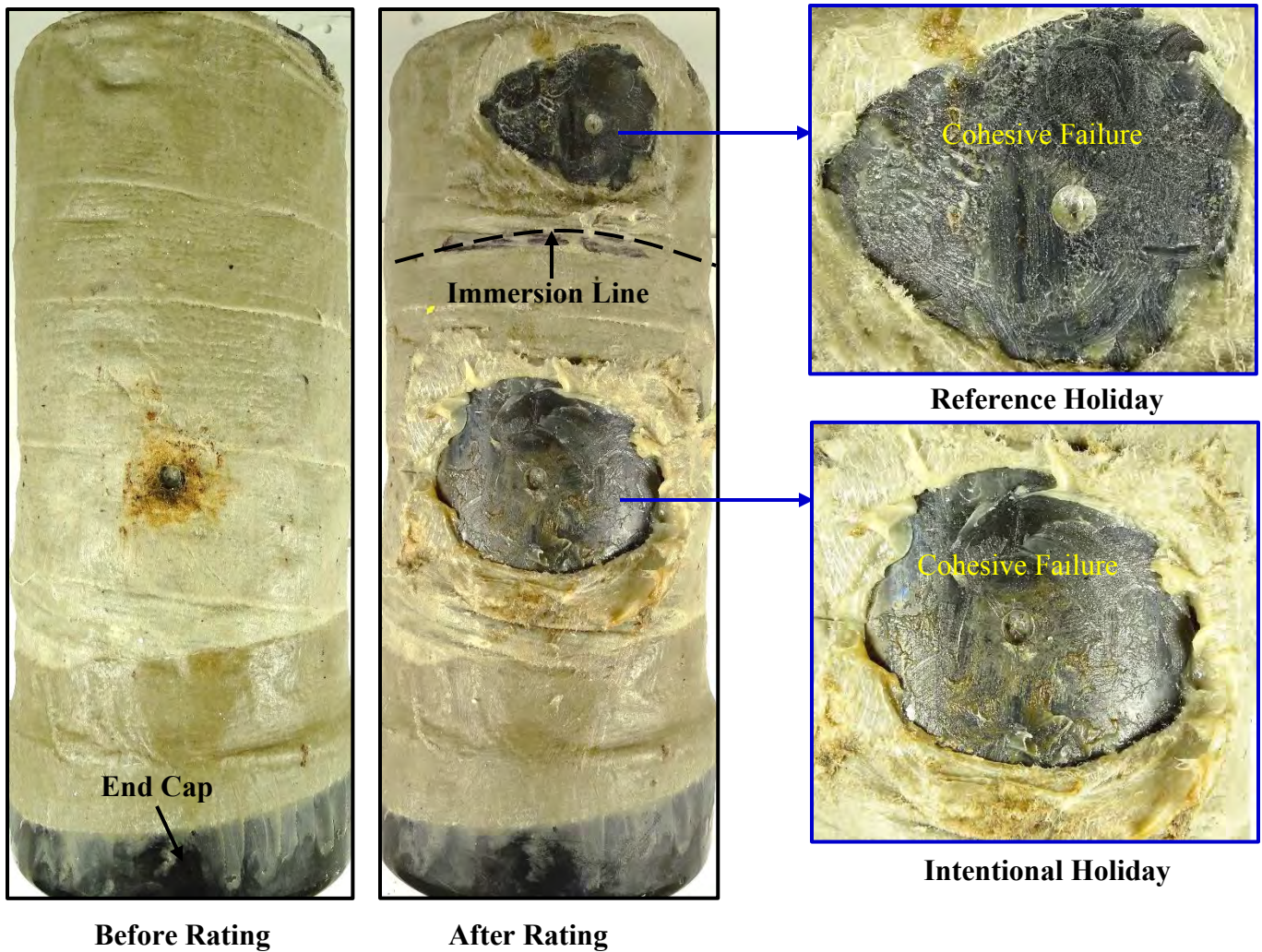


Figure 1. Cathodic Disbondment Post-test Overviews of 9170 PetroWrap Tape with Primer: PLID PRIMER, PLID WRAP as per ASTM G8-96 (2010) Method B: Thirty (30) Days at 25°C/77°F

Figure 1 shows the post-test overviews of 9170 PetroWrap Tape with Primer: PLID PRIMER, PLID WRAP after cathodic disbondment testing for thirty (30) days at 25°C/77°F. The coating system showed resistance to the test conditions, and no disbondment but the cohesive failure of coating system were noted around the reference and intentional holidays. Therefore, the equivalent circle diameter (ECD) was zero.



**CHARTER COATING SERVICE (2000) LTD.**  
**CATHODIC DISBONDMENT TEST DATA SHEET**  
**(ASTM G8 Method B Modified)**

<b>Project Number:</b>	0881-19-01-2	<b>Date Started:</b>	June 25, 2019
<b>Coating Name:</b>	9170 PetroWrap Tape with Primer: PLID PRIMER, PLID WRAP	<b>Date Finished:</b>	July 25, 2019
<b>Duration:</b>	30 Days	<b>Voltage:</b>	-1.39 V respect to Ag/AgCl
<b>Temperature:</b>	25°C/77°F	<b>Holiday Diameter:</b>	6.4 mm
<b>Test Performed By:</b>	I. Stevens and A. Mahmoud	<b>Solution:</b>	1% NaCl, 1%Na <sub>2</sub> SO <sub>4</sub> , 1%Na <sub>2</sub> CO <sub>3</sub>

Sample ID	Film Thickness (mils)		Final Unsealed Area (mm <sup>2</sup> ) <sup>1</sup>	Equivalent Circle Diameter (mm) <sup>2</sup>
	Pre-Test	Post-Test		
CD3	98 – 189 / 132	104 – 175 / 131	0	0

<sup>1</sup>Excludes initial holiday measurement and the disbondment at the reference holiday.

<sup>2</sup>Equivalent Circle Diameter (*ECD*) is obtained from the formula:

$$ECD = (A/0.785)^{1/2} \text{ where: } A = \text{area of holiday (final unsealed area), mm}^2 \text{ (in.}^2\text{)}$$

Approval Authority: Dr. Amal Al-Borno

FM-505-00-13-02

Rev 05 (2019-06-21)

## APPENDIX A

### REVISION HISTORY

Revision Level	Revision Date	Revised by	Brief Description of Revision
Rev0	July 31, 2019	DR. XU WANG	Original report
Rev01	Aug 1, 2019	Dr. XIANYI CHEN	Revised to include the coating and the supplier names

**-END OF FINAL REPORT-**