ADVINTEGRITY

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Pressure Testing of SPBP Welded Repair Design

Final Report

Prepared for

Amplify Energy Corp.

100335-RP02-Rev0-111521

November 2021

WHEN TECHNOLOGY WORKS, TREMENDOUS THINGS ARE POSSIBLE.

Pressure Testing of SPBP Welded Repair Design

Final Report

Prepared for

Amplify Energy Corp.

Houston, TX

November 2021

Prepared by:
REDACTED PII
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REDACTED PII

Reviewed by:
REDACTED PII
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REDACTED PII

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100335-RP02-Rev0-111521

Rev	Date	Description	Prepared	Checked	Reviewed
0	11.15.2021	Issued for Use	REDACT	REDACT	REDACT

Texas Registered Engineering Firm F-19081
www.advintegrity.com

Monday, November 15, 2021 100335-RP02-Rev0-111521

REDACTED PII

Amplify Energy Corp.
500 Dallas St, Suite 1700 | Houston, TX 77002
Phone: REDACTED PII | E-mail: REDACTED PII

Cory,

Enclosed is our report documenting the full-scale testing of a fabricated temporary repair intended to enclose a leaking defect identified on Amplify's San Pedro Bay Pipeline (SPBP). The temporary repair successfully contained pressure during an extended pressure hold of 17.9 hours at 1,440 psig. The full-scale test results discussed in this report demonstrate the ability of the temporary repair to contain pressure and mitigate product leakage at 1,440 psig.

Thank you for the opportunity to complete this work and please do not hesitate to contact us with any questions.

Regards,

REDACTED PII PE | Senior Associate

ADV Integrity, Inc.
28246 FM 2920 | Waller, TX 77484
Office: (REDACTED PII | E-mail: REDACTED PII
Texas Registered Engineering Firm F-190

Reviewed by: REDACTED PII, PE | Chief Engineer – Pipeline Integrity

CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION AND BACKGROUND

ADV Integrity, Inc. (ADV) was contracted by Amplify Energy Corp. (Amplify) to perform a full-scale pressure test of a temporary repair designed to contain a leaking defect identified on Amplify's San Pedro Bay Pipeline (SPBP).

This report documents ADV's full-scale test set-up, and the results of the testing designed to demonstrate the pressure containing capacity of the temporary pipeline repair. Several parties were involved in the completion of the subject test program:

- Practical Engineering Solutions, LLC (PES) designed the welded repair option, including numerical modeling considering the as-inspected shape of the SPBP.
- Crosby Construction Services (Crosby) fabricated the sample including replicating the geometric deformation and welding the temporary repair to the representative sample.
- ADV performed pressure testing of the provided sample containing the geometric deformation and temporary welded repair.

2.0 REPAIR DESIGN AND SAMPLE FABRICATION

The construction drawings for the temporary repair considered in the full-scale testing program are included in Appendix A. ADV understands that a comparable repair configuration will be fabricated for use on the actual SPBP leaking defect. The temporary repair consisted of several circumferential welds connecting end caps to a short nominal 10-inch diameter pipe section. All welds passed NDE (radiographic and magnetic particle testing) as documented in in Appendix B. The temporary repair also included two, 2-inch threadolets and bull plugs that could be used to provide venting during underwater welding. The 10-inch vessel was then cut longitudinally to form a standoff temporary repair and welded over a simulated through-wall defect fabricated onto the deformed pipe using a ¾ inch single sided fillet weld, per the drawings included in Appendix A. In addition to the temporary repair, holes will be drilled at the termination of each end of the crack (i.e., drill stops), as shown in Figure 2-1 on the test vessel. These drill stops are installed to mitigate crack propagation.

The fillet weld between the 10-inch repair and SPBP carrier pipe will be completed by underwater welders per a Phoenix WPS using an Oxylance Sureweld #1 SMAW consumable that meets AWS A5.1, E6013. ADV understands that the Crosby fillet weld on the fabricated sample for testing was completed using E6010 SMAW consumables and capped with a E71T-21M FCAW consumable for aesthetic purposes. Therefore, the final cap pass of the fabricated test sample was completed using a higher strength consumable when compared to the planned actual repair; however, the majority of the weld in the fabricated test sample was completed using E6010 consumables of the same nominal tensile strength. This difference in strength for the weld cap is not expected to have a material impact on the performance of the fabricated sample. The Phoenix WPS describes the parameters and conditions for the welded temporary repair tested, including material property and attribute requirements. Based on the MTRs provided to ADV, the SPBP carrier pipe and the material used for the repair fabrication fall within the Phoenix WPS limitations.

Figure 2-1: Photograph of test vessel with installed crack and drill stops.

3.0 3D SCAN OF FABRICATED TEST VESSEL

Upon receipt of the test vessel fabricated by Crosby, ADV scanned the vessel using a Creaform HandyScan 307 with reflective positioning targets applied to the outside surface. 3D renderings of the test vessel are shown in Figure 3-1 and Figure 3-2. This data was used to understand the physical performance of the temporary repair after pressure testing.

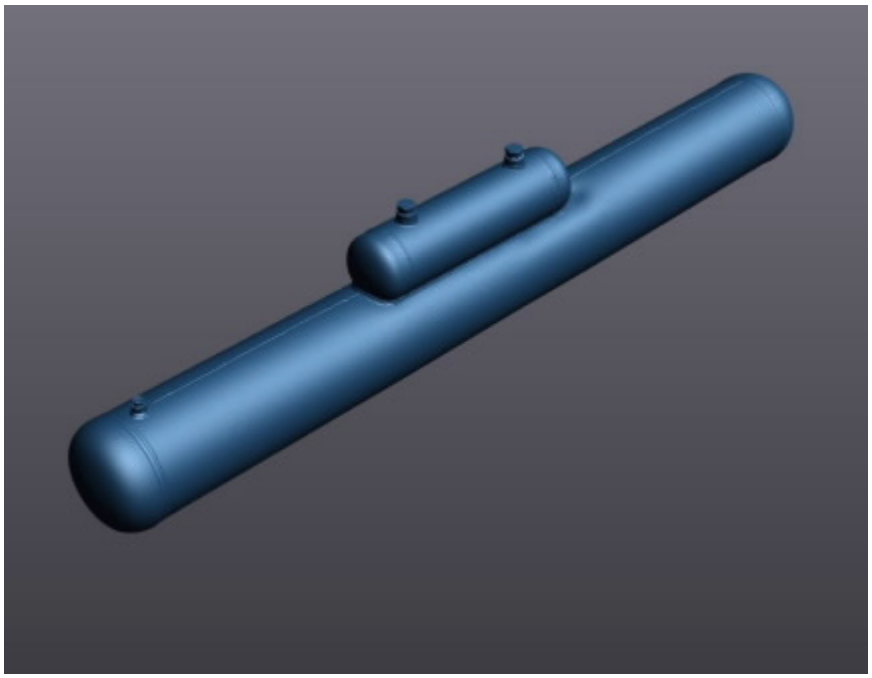


Figure 3-1: 3D rendering of the test vessel received by ADV.

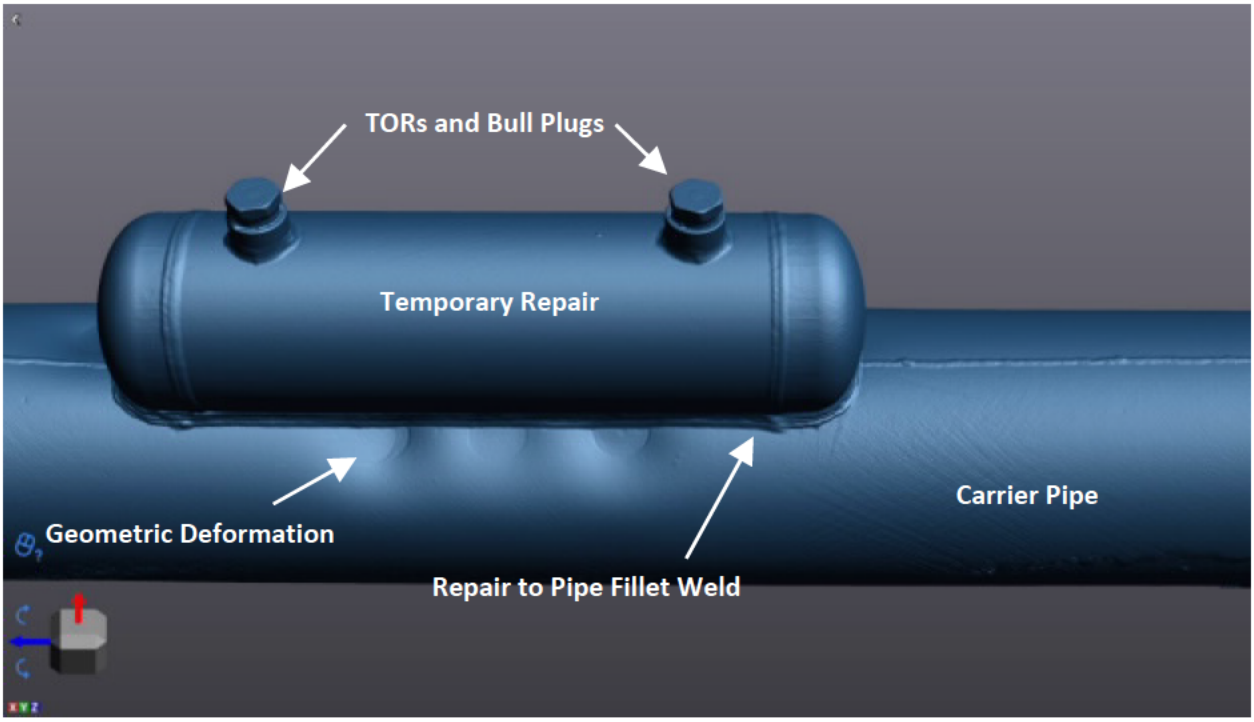


Figure 3-2: 3D rendering showing relationship between temporary repair and geometric deformation on the received pipe sample.

4.0 FULL-SCALE TESTING

ADV's pressure test plan included several full-scale testing steps, including pressure cycling, an extended pressure hold, and short duration holds at a higher pressure. The pressure was monitored via a pressure transducer fixed to the test vessel's outlet. The calibration certificate is attached in Appendix C. The sample was enclosed in ADV's test chamber, shown in Figure 4-1.

The as-received pipe sample survived 10 pressure cycles between 250 psig and 500 psig. A pressure increase was attempted to bring the pressure up to 1,440 psig for an extended hold. However, a leak occurred along the threads within one of the TOR/Bull Plugs. Therefore, ADV seal welded the plugs and restarted the test. This finding was helpful in optimizing the final design of the temporary repair. The final design will not include a similar TOR/Bull Plug, thereby, minimizing the likelihood of a similar leak path.

After seal welding the TOR/Bull plugs, the cyclic test program was restarted. Cyclic testing was repeated as shown in Figure 4-2, and then the pressure was increased to 1,440 psig. This pressure was held overnight resulting in a 17.9 hour hold as shown in Figure 4-3. Upon completion of this hold, ADV increased the pressure to find the maximum pressure containing capacity of the temporary repair. At 1,619 psig the pressure within the sample started to decrease. Upon inspection, it was discovered that the temporary repair had begun to experience plastic deformation without an identified leak as shown in Figure 4-4 and further quantified in Section 5.0, Post-Test 3D Scan. Therefore, ADV stopped the testing program. The most significant conclusion from this test was that the test vessel successfully contained pressure for 17.9 hours at 1,440 psig providing confidence in the welded temporary repair's ability to contain pressure and mitigate product leakage.

Figure 4-1: Photograph of test vessel enclosed in ADV's test chamber.

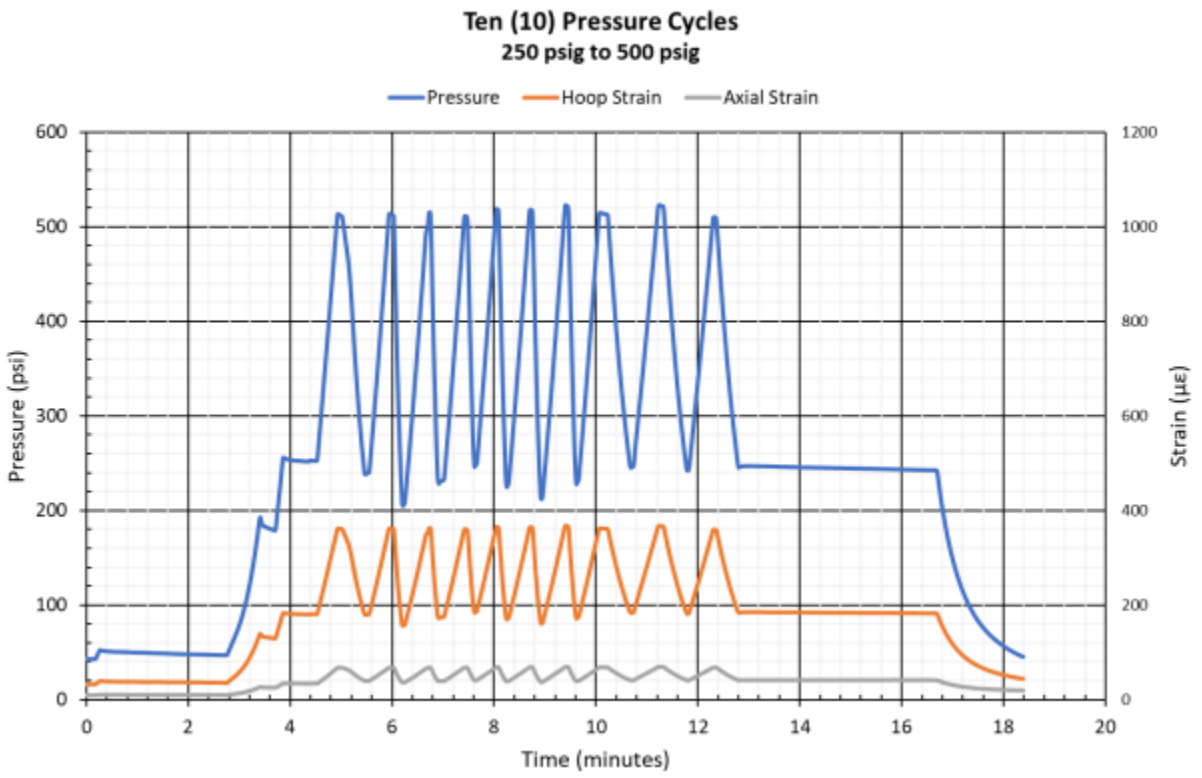


Figure 4-2: Time vs. Pressure plot during pressure cycling.

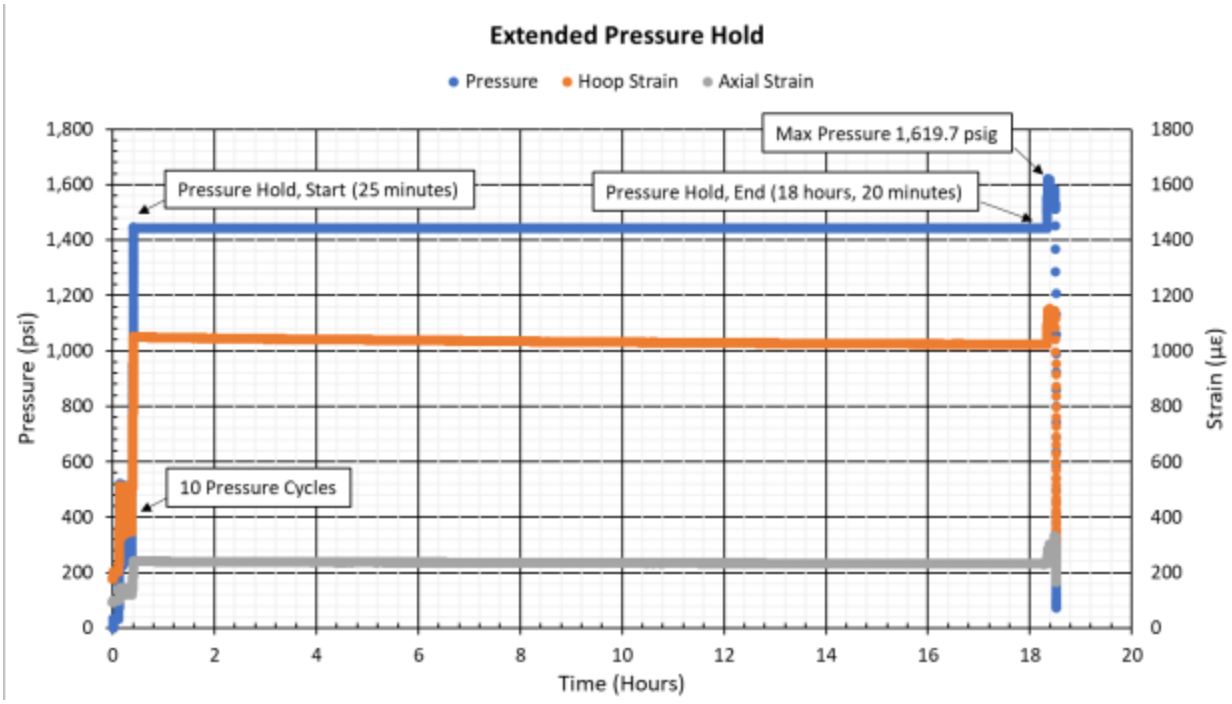


Figure 4-3: Time vs. Pressure plot during 17.9 hour pressure hold.

Figure 4-4: Photograph showing resulting plastic deformation of the temporary repair.

5.0 POST-TEST 3D SCAN

After completion of the full-scale test, ADV scanned the vessel using a Creaform HandyScan 307 with reflective positioning targets applied to the outside surface. A 3D rendering of the test vessel is shown in Figure 5-1. The 3D scan captured the change in the temporary repair diameter as shown in Figure 5-2. To better quantify the change in shape, ADV prepared a virtual cross section through the pipe/repair assembly, shown as green lines in Figure 5-3. The pre- and post-test diameter of the temporary repair at nine (9) locations were tabulated and presented in Figure 5-4. A maximum change in diameter of 0.96 inch between the pre- and post-test measurements was calculated.

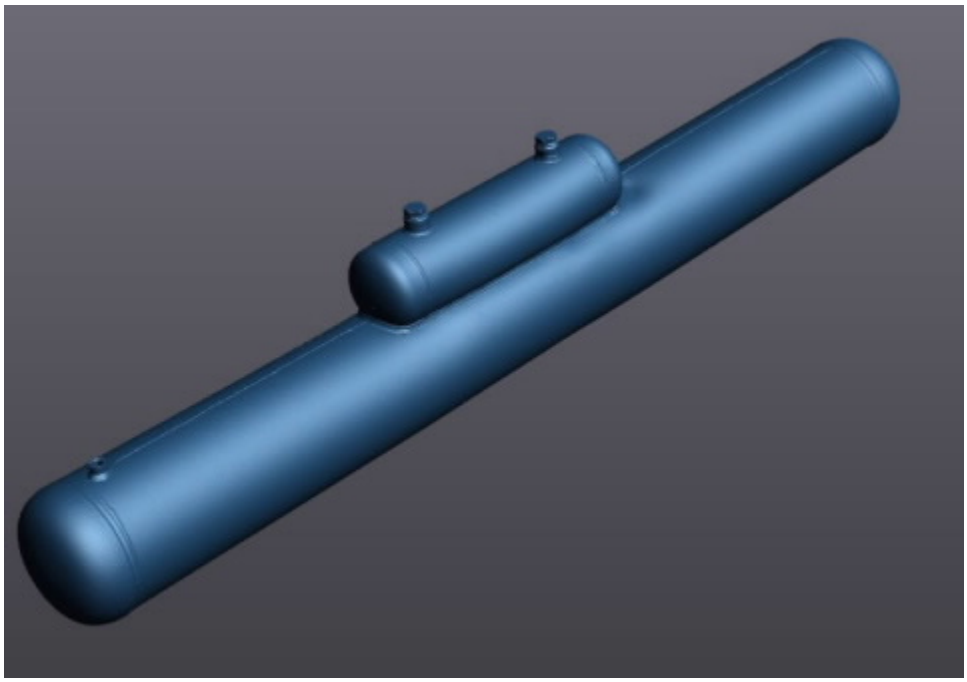


Figure 5-1: 3D rendering of sample after testing.

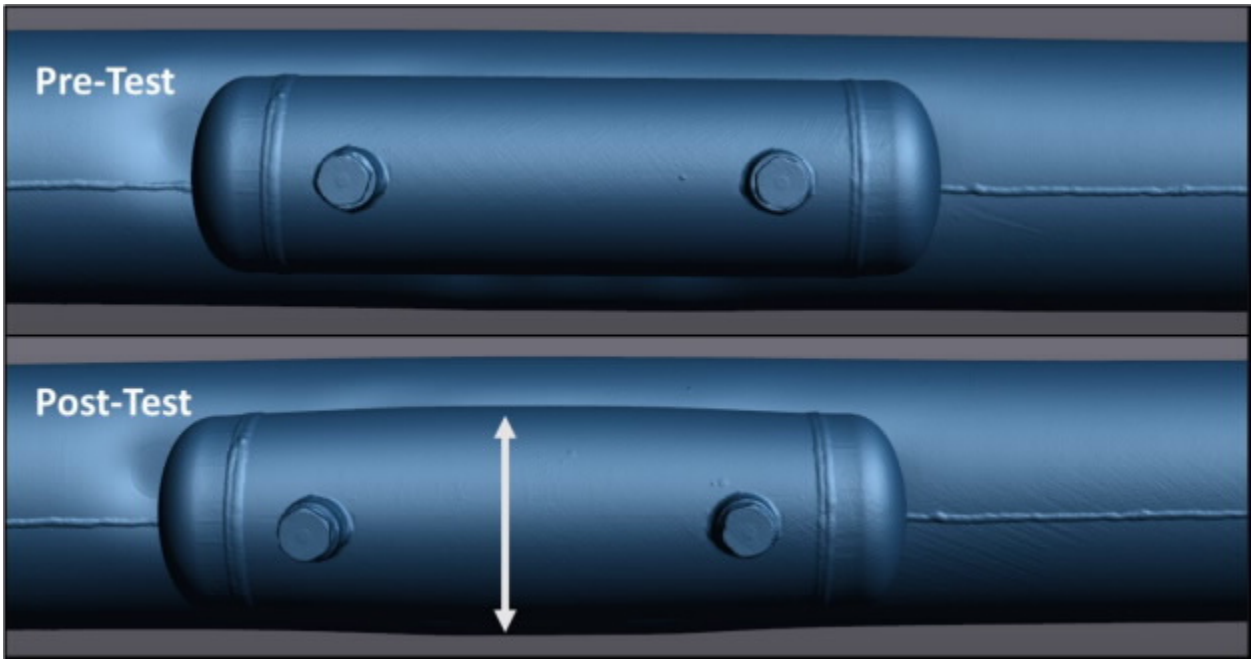


Figure 5-2: 3D rendering of temporary repair showing change in shape (white arrow).

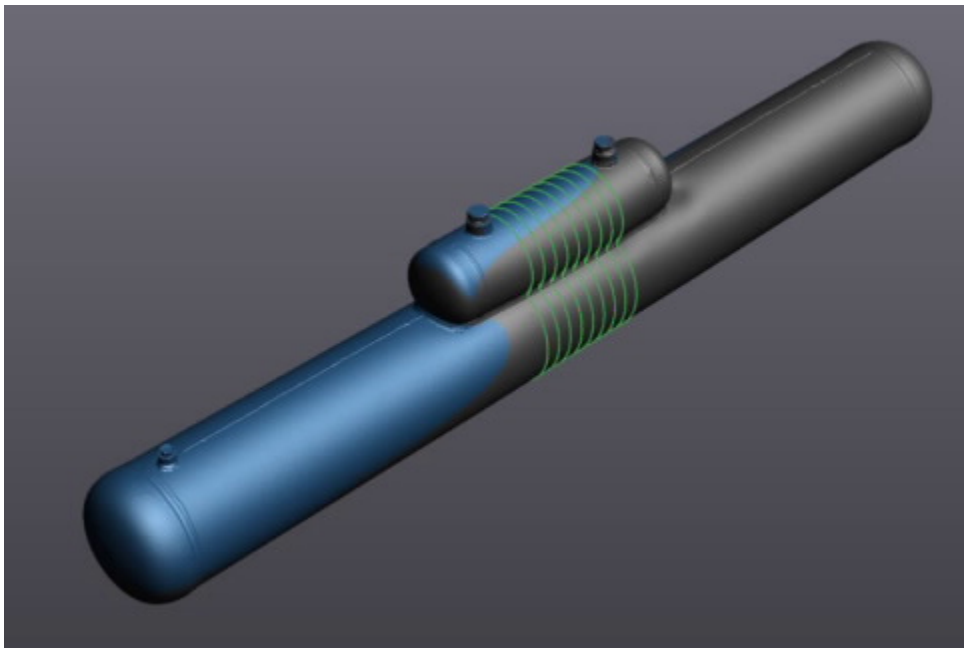


Figure 5-3: 3D rendering showing virtual cross sections through the temporary repair assembly.

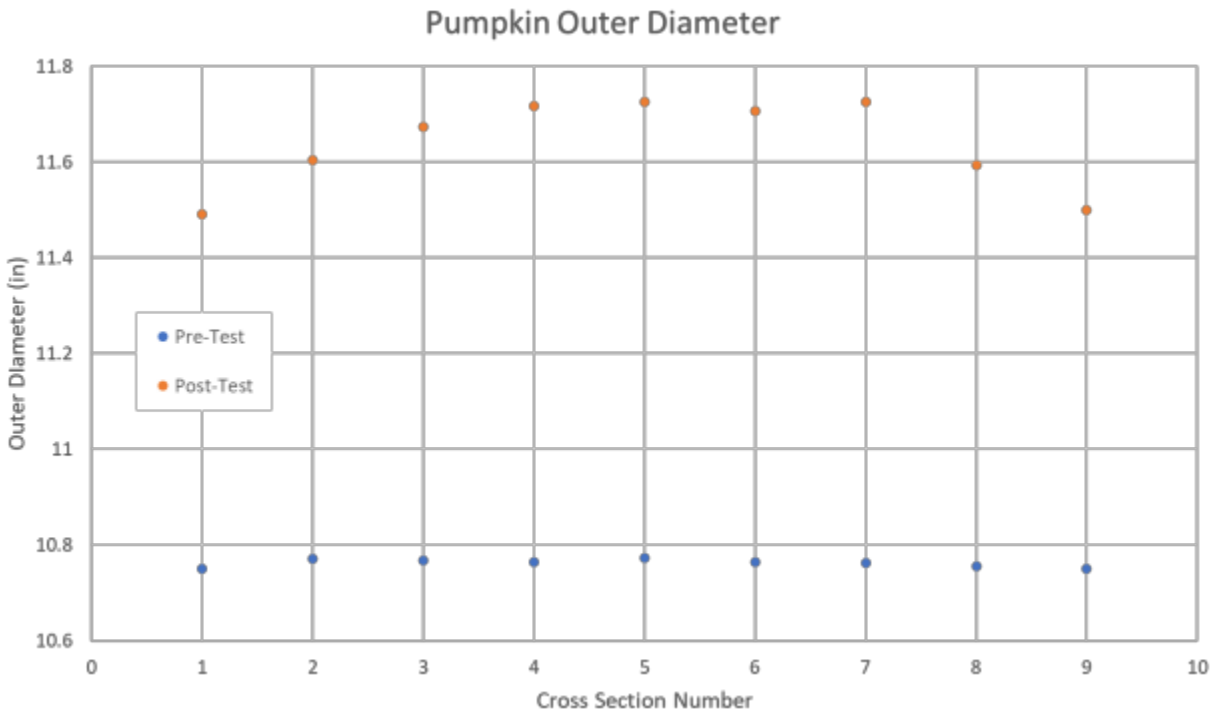


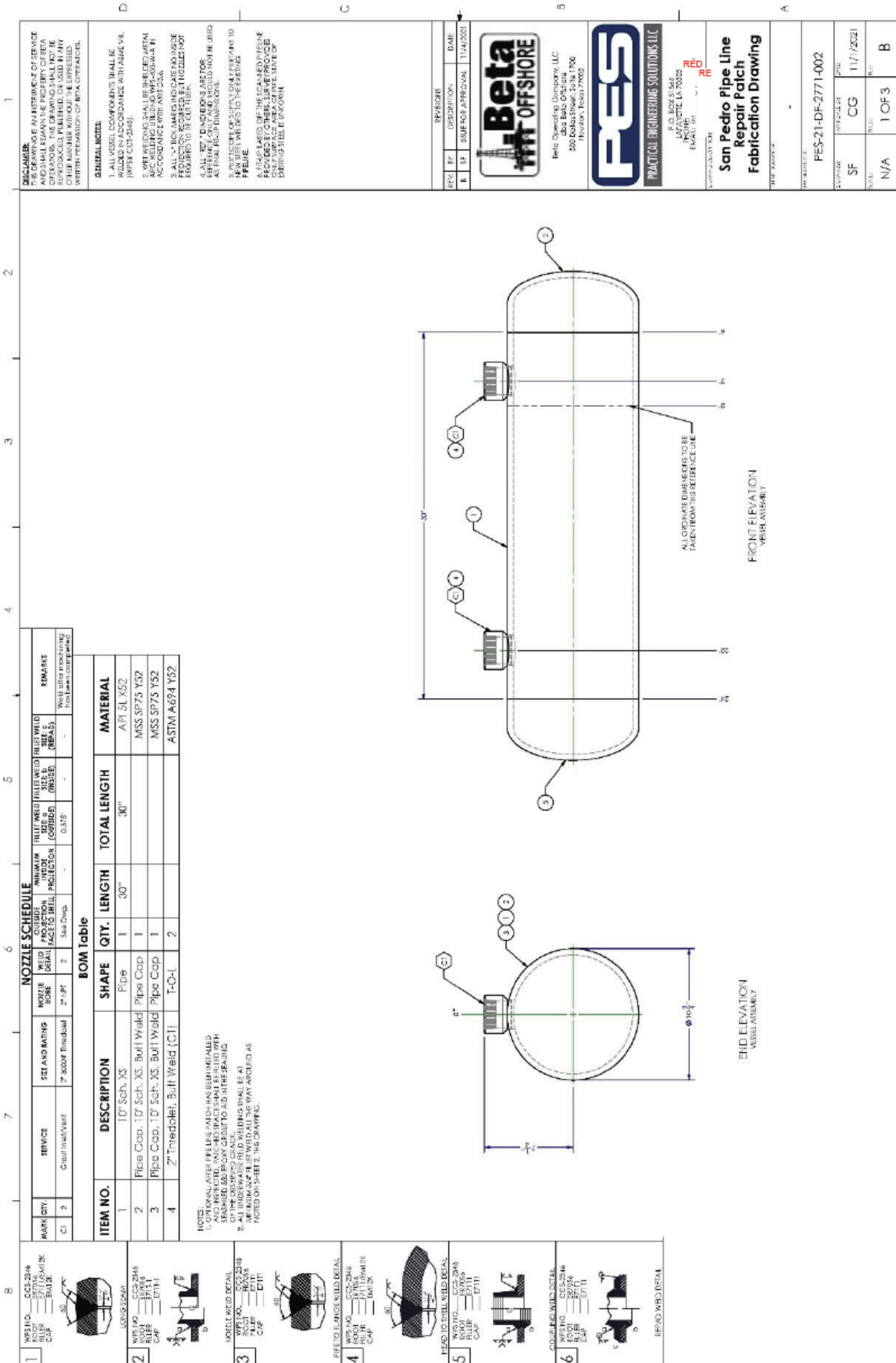
Figure 5-4: Plot comparing outer diameter of temporary repair, pre- and post-test.

6.0 SUMMARY

The temporary repair as received by ADV passed simulated pressure cycles and an extended pressure hold of 17.9 hours at 1,440 psig. This simulation's most significant conclusion was that the tested vessel successfully contained pressure for 17.9 hours at 1,440 psig providing confidence in the welded temporary repair's ability to contain pressure and mitigate product leakage.

The results discussed in this report reflect the manufacturing processes of the temporary repair. If the processes used to construct and install the actual SPBP repair are followed, then it is expected the actual temporary repair will survive 1,440 psig. Critical parameters include the shape of the repair vessel, actual strength of materials used for the temporary repair, actual strength of weld material, quality of deposited weld metal, temporary repairs surface matching to the pipeline's geometric deformation, and WPS using during welding.

APPENDIX A: FULL-SCALE TEST REPAIR FABRICATION

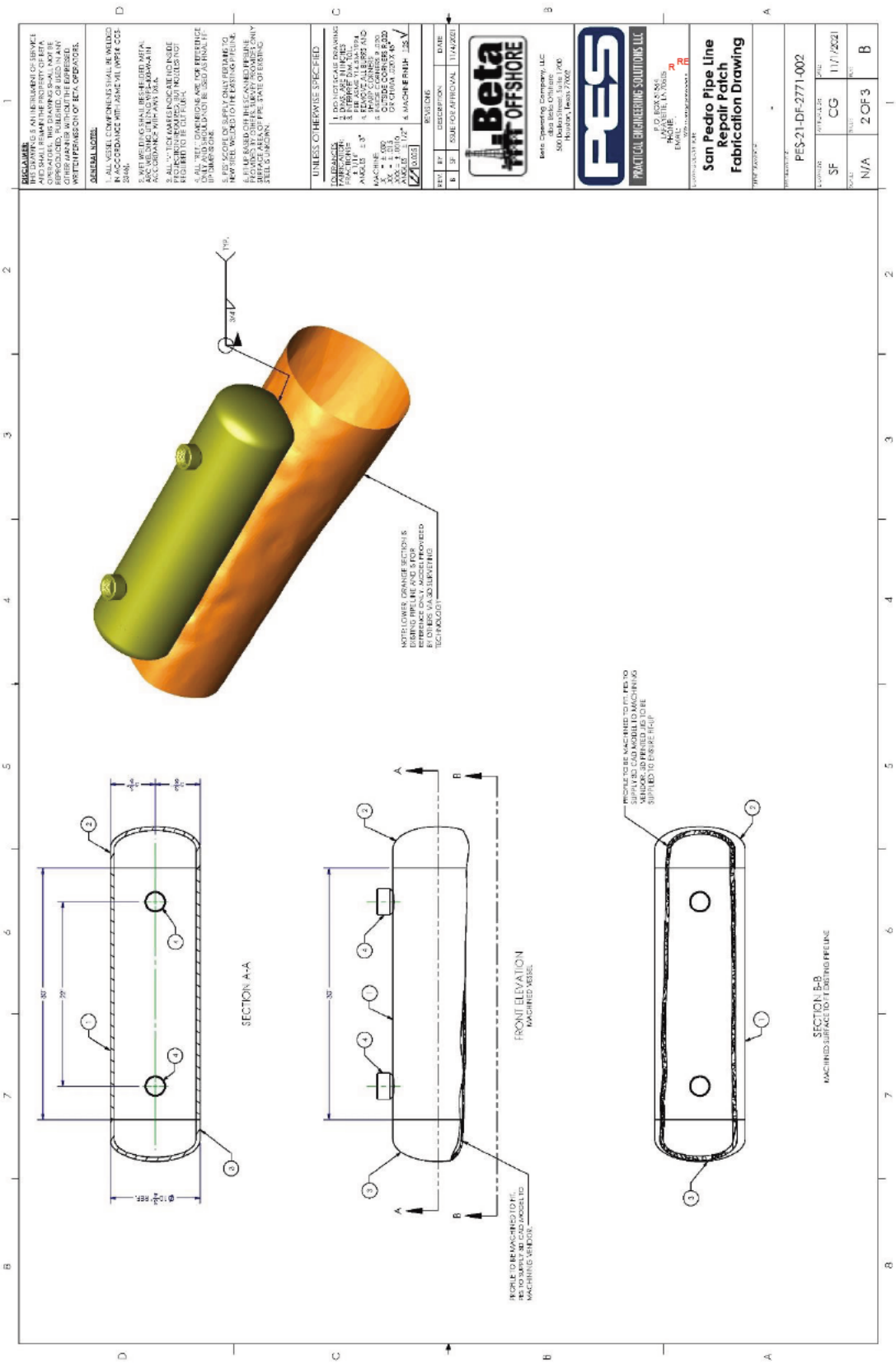


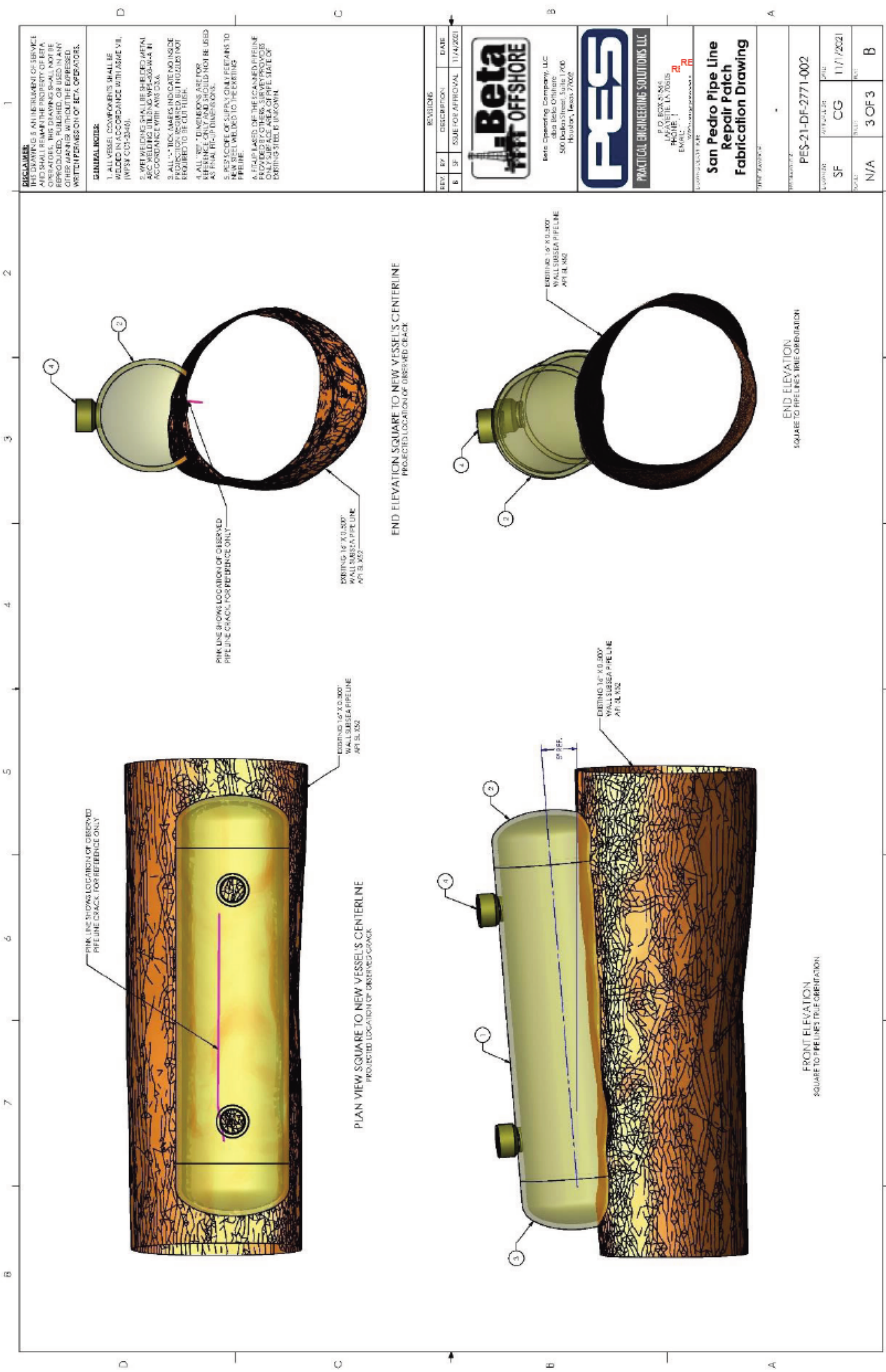
NOZZLE SCHEDULE

MARK	QTY.	SERVICE	SIZE AND RATING	NOZZLE BORE	WELD DETAIL	OUTSIDE PROJECTION FACE TO SHELL	MINIMUM INSIDE PROJECTION	FILLET WELD SIZE: a (OUTSIDE)	FILLET WELD SIZE: b (INSIDE)	FILLET WELD SIZE: c (REPAD)	REMARKS
C1	2	Grout Inlet/Vent	2" 3000# Thredolet	2" NPT	2	See Dwg.	-	0.375"	-	-	Weld after machining has been completed

BOM Table

ITEM NO.	DESCRIPTION	SHAPE	QTY.	LENGTH	TOTAL LENGTH	MATERIAL
1	10" Sch. XS	Pipe	1	30"	30"	API 5L X52
2	Pipe Cap, 10" Sch. XS, Butt Weld	Pipe Cap	1			MSS SP75 Y52
3	Pipe Cap, 10" Sch. XS, Butt Weld	Pipe Cap	1			MSS SP75 Y52
4	2" Thredolet, Butt Weld (C1)	T-O-L	2			ASTM A694 Y52


San Pedro Pipe Line
Repair Patch
Fabrication Drawing
PES-21-DF-2771-002
SECTION A-A
FRONT ELEVATION
MACHINED WELD
SECTION B-B
MACHINED SURFACE TO FIT EXISTING PIPELINE


San Pedro Pipe Line
Repair Patch
Fabrication Drawing
PES-21-DF-2771-002
PRACTICAL ENGINEERING SOLUTIONS LLC
END ELEVATION SQUARE TO NEW VESSEL'S CENTERLINE
END ELEVATION
PLAN VIEW SQUARE TO NEW VESSEL'S CENTERLINE
FRONT ELEVATION
3 OF 3

APPENDIX B: NDE OF TEST SPOOL

NDE Results

Section 4

SJL **DAILY WORK REPORT**

No. O - 180497 - 1 of 1

Rev. No. 0

Mailing Address:
209 Industrial Trace
Broussard, LA 70518

ACCURATE NDE & INSPECTION, L.L.C.

Telephone REDACTED PII
Fax REDACTED PII

Customer: Crosby Construction Services, Inc. | Fabricator: Crosby Construction Services, Inc.
Ordered By: REDACTED PII | Location of Job: Unknown
Job No: 2363 | P.O. | AFE | Other: AGW110521
Company: Amplify | Grading Criteria: API 1104
Customer Representative | Technician: REDACTED PII, Level II
Date: 5-Nov-2021 | Assistant: REDACTED PII
Film Delivered to ANDE Mgr: | Client | Assistant
X-Ray | Gamma Ray: ✓
3.5 x 10: 0 | 4.5 x 10: 0 | 4.5 x 17: 40 | 7 x 17: 0 | 14 x 17: 0
No. of Welds Checked: 12 | Hours Worked: 6 | Travel Time: N/C | Mileage: N/C

WELD NO.	PIPE SIZE	SCH.	THK.	RECOMMENDATION ✓	RECOMMENDATION X	RECOMMENDATION ACCEPT / REJECT	REMARKS, LINE NUMBER, WELDER'S STENCIL, ETC.
W1						WIS V	TS-1
1-	16.000	XH	0.500	✓			
2-	16.000	XH	0.500	✓			
3-	16.000	XH	0.500	✓			
4-	16.000	XH	0.500	✓			
W2						WIS V	TS-1
1-	16.000	XH	0.500	✓			
2-	16.000	XH	0.500	✓			
3-	16.000	XH	0.500	✓			
4-	16.000	XH	0.500	✓			
W1						WIS V	TS-2
1-	16.000	XH	0.500	✓			
2-	16.000	XH	0.500	✓			
3-	16.000	XH	0.500	✓			
4-	16.000	XH	0.500	✓			
W2						WIS V	TS-2
1-	16.000	XH	0.500	✓			
2-	16.000	XH	0.500	✓			
3-	16.000	XH	0.500	✓			
4-	16.000	XH	0.500	✓			
W1						WIS U,P	HD-1
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W2						WIS U,P	HD-1
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			

WELD NO.	PIPE SIZE	SCH.	THK.	RECOMMENDATION ✓	RECOMMENDATION X	RECOMMENDATION ACCEPT / REJECT	REMARKS, LINE NUMBER, WELDER'S STENCIL, ETC.
W1						WIS U,P	HD-2
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W2						WIS U,P	HD-2
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W1						WIS U,P	HD-3
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W2						WIS U,P	HD-3
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W1						WIS U,P	HD-4
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			
W2						WIS U,P	HD-4
1-	10.000	XH	0.500	✓			
2-	10.000	XH	0.500	✓			
3-	10.000	XH	0.500	✓			

TOTAL INSPECTED: 471.00 "

ANDE PROC: ACC-RT-03-GEN, REV.4

SJL **TECHNIQUE SHEET**

Mailing Address:
209 Industrial Trace
Broussard, LA 70518

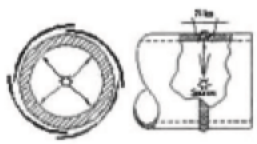
ACCURATE NDE & INSPECTION, L.L.C.

No. O - 180497 1 of 1
Rev. No. 0

Telephone
REDACTED PII
Fax
REDACTED PII

Customer	Crosby Construction Services, Inc.	Fabricator	Crosby Construction Services, Inc.
Company	Amplify	Location of Job	Unknown
Job No	2363	P.O.	AFE	Other	AGW110521
Serial #		Grading Criteria	API 1104
Technique	2 - DWE/SWV	Source Size	0.124	Source Type:	Co 60	Ir 192	✓
Seam Examined:	Circumferencial	✓	Longitudinal	Plate	Pipe	✓
Diameter	10.000 - 10.750 (Actual)	Sch.	XH	Thk.	0.500	Material Type	C/S
Penetrameter Information:	Source Side	Film Side	✓	Penetrameter Size	ASTM 1B
Shim Thickness	N/A, no shims used	Markers:	Source Side	Film Side	✓
Film Type:	FUJI 100	Lead Screens:	Front 0.010"	Back 0.010"	Object to Film Distance	0.625
Source to Film Distance	11.250	Source to Object Distance	10.625	Geometric Unsharpness	0.0073
Source Strength:	KV N/A	MA N/A	Curies 121	Exposure Time	19 secs.
Total Number Film Used	3	Max. Allowable Weld Reinforcement	0.125
Film Processing:	Automatic	✓	Manual	
Developer Brand	FUJI	Temperature	82 °F	Time	3.5 minutes
Stop Bath Brand	N/A	Temperature	N/A °F	Time	N/A
Fixer Brand	FUJI	Temperature	82 °F	Time	3.5 minutes
Rinse Temperature	72 °F	Time	3 minutes	Wetting Agent	N/A °F	Time	N/A

1 - SWE/SWV



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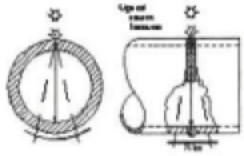

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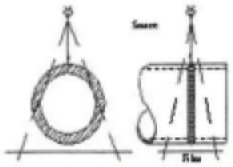

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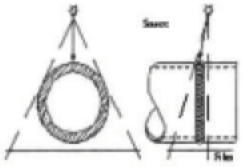
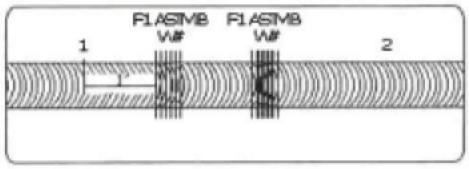




SKETCH OF FILM SHOWING WELD, LOCATION OF PENETRAMETERS, AND REFERENCE MARKERS:

Technician	REDACTED PII Level II	Film Interpreted/Viewed By	REDACTED PII
Assistant	REDACTED PII	Date	5-Nov-2021

SJL **TECHNIQUE SHEET**

Mailing Address:
209 Industrial Trace
Broussard, LA 70518

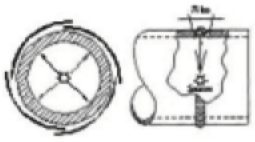
ACCURATE NDE & INSPECTION, L.L.C.

No. O - 180497 1 of 1
Rev. No. 0

Telephone REDACTED PII
Fax REDACTED PII

Customer	Crosby Construction Services, Inc.		Fabricator	Crosby Construction Services, Inc.	
Company	Amplify		Location of Job	Unknown	
Job No	2363	P.O.	AFE	Other	AGW110521
Serial #			Grading Criteria	API 1104	
Technique	2 - DWE/SWV	Source Size 0.124	Source Type:	Co 60	Ir 192 ✓
Seam Examined:	Circumferencial ✓	Longitudinal	Plate	Pipe ✓	
Diameter	16.000 - 16.000 (Actual)	Sch. XH	Thk. 0.500	Material Type	C/S
Penetrameter Information:	Source Side	Film Side ✓	Penetrameter Size	ASTM 1B	
Shim Thickness	N/A, no shims used	Markers: Source Side		Film Side ✓	
Film Type:	FUJI 100	Lead Screens: Front 0.010"	Back 0.010"	Object to Film Distance	0.625
Source to Film Distance	16.500	Source to Object Distance	15.875	Geometric Unsharpness	0.0049
Source Strength: KV	N/A	MA N/A	Curies 121	Exposure Time	42 secs.
Total Number Film Used	4		Max. Allowable Weld Reinforcement		0.125
Film Processing:	Automatic ✓		Manual		
Developer Brand	FUJI	Temperature 82 °F		Time	3.5 minutes
Stop Bath Brand	N/A	Temperature N/A °F		Time	N/A
Fixer Brand	FUJI	Temperature 82 °F		Time	3.5 minutes
Rinse Temperature	72 °F	Time 3 minutes	Wetting Agent N/A	°F	Time N/A

1 - SWE/SWV



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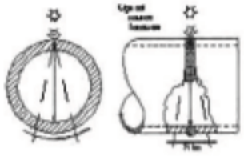

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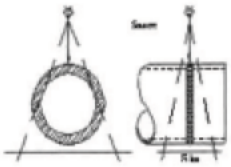

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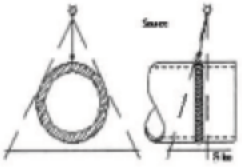
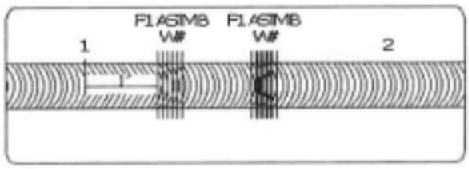




SKETCH OF FILM SHOWING WELD, LOCATION OF PENETRAMETERS, AND REFERENCE MARKERS:

Technician REDACTED PII Level II
Assistant REDACTED PII

Film Interpreted/Viewed By REDACTED PII
Date 5-Nov-2021

SJL **DAILY WORK REPORT**

Mailing Address:
209 Industrial Trace
Broussard, LA 70518

ACCURATE NDE & INSPECTION, L.L.C.

No. O - 180498 - 1 of 1

Rev. No. 0

Telephone REDACTED PII
Fax REDACTED PII

Customer	Crosby Construction Services, Inc. REDACTED PII	Fabricator	Crosby Construction Services, Inc.
Ordered By		Location of Job	Unknown
Job No	2363 P.O.	AFE	Other AGW110521
Company	Amplify	Grading Criteria	API 1104
Customer Representative		Technician	REDACTED PII Level II
Date	5-Nov-2021	Assistant	REDACTED PII
Magnetic Particle	✓ Dye Penetrant	Consumables	1 Can of paint & 1 Can of 7HF
No. of Welds Checked	2 Hours Worked 1	Travel Time	N/C Mileage N/C

WELD NO.	SIZE	RECOMMENDATION ✓ ACCEPT	RECOMMENDATION ✗ REJECT	LINE NUMBER, WELDER'S STENCIL, REMARKS, ETC.
MT1	16" XH PIPE	✓		TS-1 CRACK
MT2	16" XH PIPE	✓		TS-2 CRACK
				ANDE PROC: ACC-MT-03-GEN, REV.10
				MAGNETIC PARTICLE EXAMINATION WAS PERFORMED
				PER ASTM E-709.
				NO REJECTABLE INDICATIONS WERE FOUND.
				KY-P2 PERMANENT YOKE, 3"-6" SPACING, 40LB TEST

SJL **DAILY WORK REPORT**

Mailing Address:
209 Industrial Trace
Broussard, LA 70518

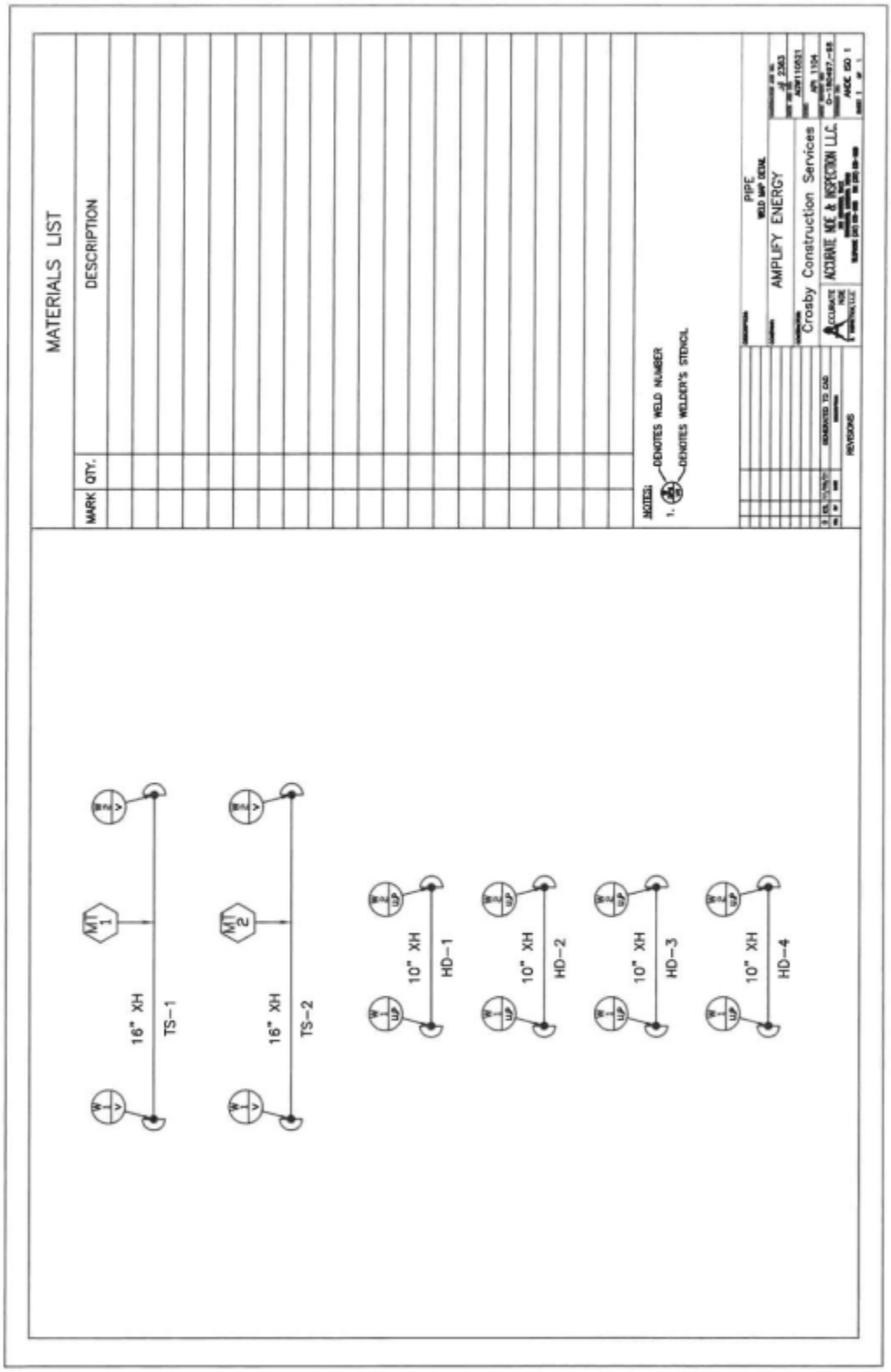
ACCURATE NDE & INSPECTION, L.L.C.

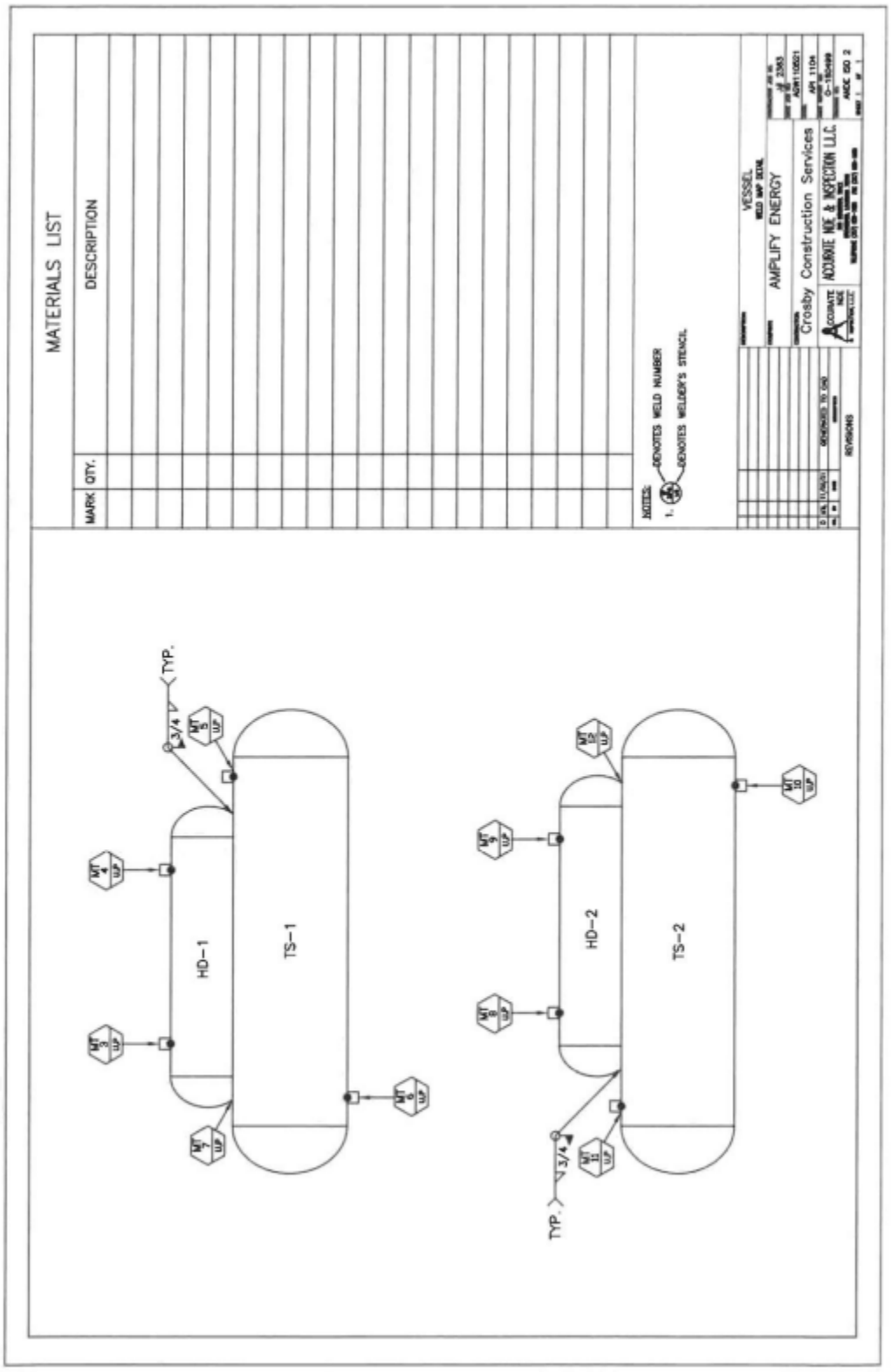
Telephone REDACTED PII
Fax REDACTED PII

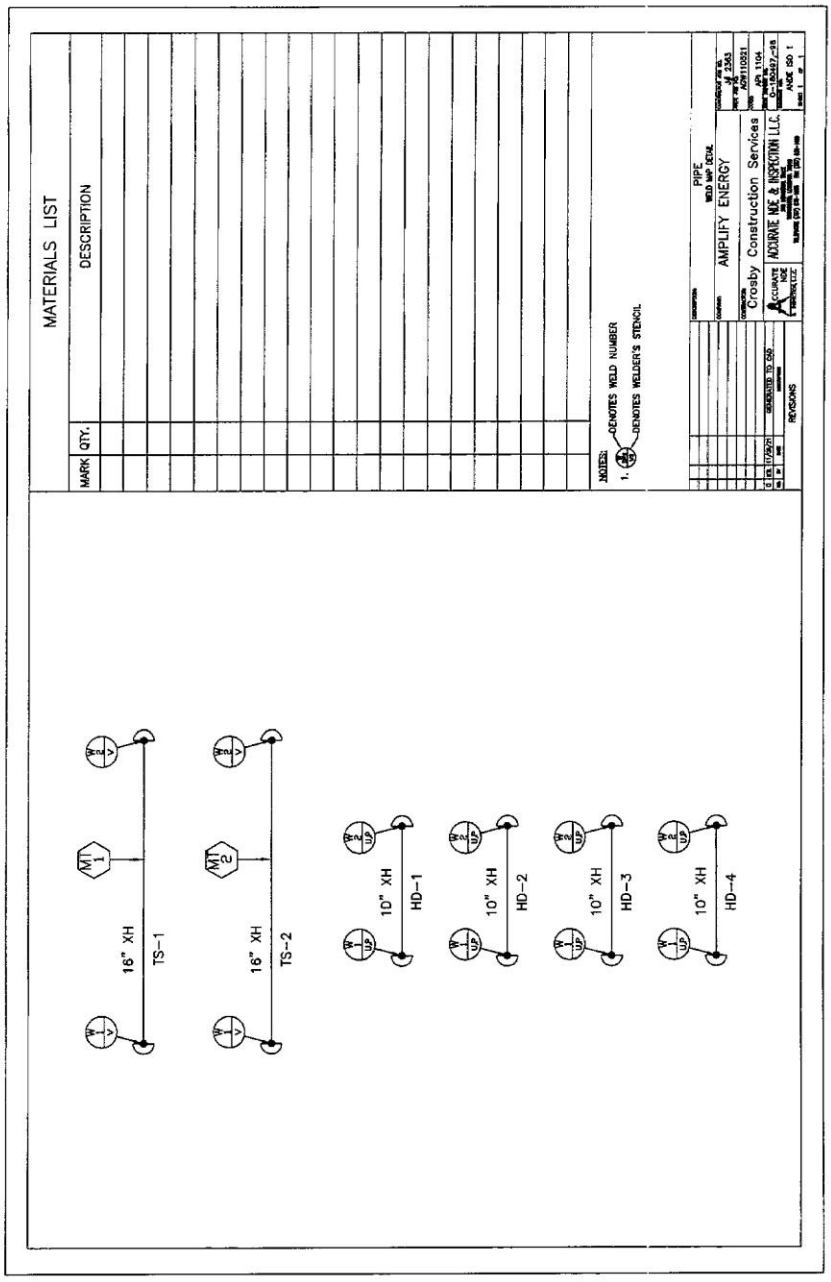
No. O - 180499 - 1 of 1
Rev. No. 0

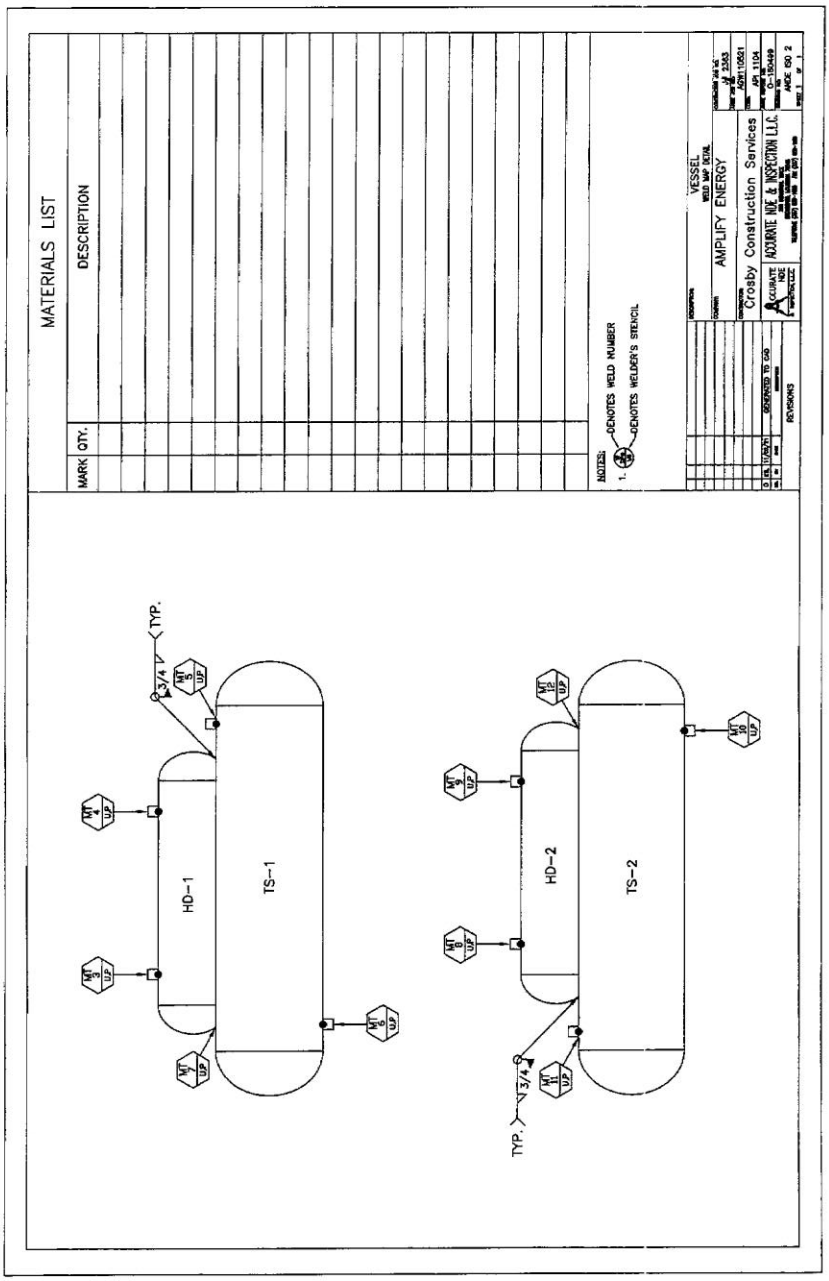
Customer	Crosby Construction Services, Inc.	Fabricator	Crosby Construction Services, Inc.
Ordered By	REDACTED PII	Location of Job	Unknown
Job No	2363 P.O.	AFE	Other AGW110721
Company	Amplify	Grading Criteria	API 1104
Customer Representative		Technician	REDACTED PII Level II
Date	7-Nov-2021	Assistant	0
Magnetic Particle	✓ Dye Penetrant	Consumables	1 Can of paint & 1 Can of 7HF
No. of Welds Checked	10 Hours Worked 4	Travel Time	N/C Mileage N/C

WELD NO.	SIZE	RECOMMENDATION ✓ ACCEPT	RECOMMENDATION X REJECT	LINE NUMBER, WELDER'S STENCIL, REMARKS, ETC.
MT3	2" TOL	✓		TS-1 / HD-1, W/S U,P
MT4	2" TOL	✓		TS-1 / HD-1, W/S U,P
MT5	1" TOL	✓		TS-1 / HD-1, W/S U,P
MT6	1" TOL	✓		TS-1 / HD-1, W/S U,P
MT7	36" X .75"	✓		FILLET WELD HD-1 TO TS-1, W/S U,P
MT8	2" TOL	✓		TS-2 / HD-2, W/S U,P
MT9	2" TOL	✓		TS-2 / HD-2, W/S U,P
MT10	1" TOL	✓		TS-2 / HD-2, W/S U,P
MT11	1" TOL	✓		TS-2 / HD-2, W/S U,P
MT12	36" X .75"	✓		FILLET WELD HD-2 TO TS-2, W/S U,P
				TOTAL INSPECTED:
				230.31 "
				ANDE PROC: ACC-MT-03-GEN, REV.10
				MAGNETIC PARTICLE EXAMINATION WAS PERFORMED
				PER ASTM E-709.
				NO REJECTABLE INDICATIONS WERE FOUND.
				KY-P2 PERMANENT YOKE, 3"-6" SPACING, 40LB TEST


MATERIALS LIST
MARK
QTY.
DESCRIPTION
NOTES:
1. DENOTES WELD NUMBER
DENOTES WELDER'S STENCIL
PIPE
AMPLIFY ENERGY
Crosby Construction Services
ACCURATE NDE & INSPECTION L.L.C.
REVISIONS
16" XH
TS-1
16" XH
TS-2
10" XH
HD-1
10" XH
HD-2
10" XH
HD-3
10" XH
HD-4


MATERIALS LIST
MARK
QTY.
DESCRIPTION
NOTES:
1. DENOTES WELD NUMBER
DENOTES WELDER'S STENCIL
VESSEL
AMPLIFY ENERGY
Crosby Construction Services
ACCURATE NDE & INSPECTION L.L.C.
REVISIONS
HD-1
TS-1
HD-2
TS-2
TYP.
3/4"
TYP.
3/4"


MATERIALS LIST
MARK
QTY.
DESCRIPTION
NOTES:
1. DENOTES WELD NUMBER
DENOTES WELDER'S STENCIL
PIPE
WELD MAP DETAIL
AMPLIFY ENERGY
Crosby Construction Services
ACCURATE NDE & INSPECTION LLC.
REVISIONS
16" XH
TS-1
16" XH
TS-2
10" XH
HD-1
10" XH
HD-2
10" XH
HD-3
10" XH
HD-4


MATERIALS LIST
MARK
QTY.
DESCRIPTION
NOTES:
1. —DENOTES WELD NUMBER
—DENOTES WELDER'S STENCIL
VESSEL
AMPLIFY ENERGY
Crosby Construction Services
ACCURATE NDE & INSPECTION LLC
HD-1
TS-1
HD-2
TS-2
TYP.
3/4"
MT
UP

APPENDIX C: PRESSURE TRANSDUCER CALIBRATION

SPECIALLOY INSTRUMENTATION

Specialloy Texas, Inc.
11702 Brittmoore Park
Houston, Texas 77041
REDACTED PII

Certificate of Calibration

Transmitter

Certificate No. 088421-1 **Print Date** 5/4/2021

Unit Under Test(UUT)

UUT ID:	08609-GS	Calibration Date:	5/4/2021
Model:	TD1000BBG5000G0002X	Expiration Date:	5/4/2022
Range:	(0~5000)psi	Manufacturer:	TRANSDUCERS DIRECT
Resolution:	0.001mA	Customer:	ADV INTEGRITY
Application Site:	Specialloy Calibration Laboratory		
Accuracy:	0.25% FS		

Calibration Results

	Result	Max Error	Temperature	Humidity	Atmospheric pressure
As Found	In tolerance	0.92 %	73°F	52%	0.991 kPa
As Left	In tolerance	0.92 %	73°F	52%	0.991 kPa

Calibration Data - As Found

Max Error: 0.92 %

SetPoints psi	Reference psi	Nominal mA	Reference mA	Tolerance mA	Deviation mA	Error (%)
0	0	4.000	4.074	0.040	0.074	0.46
1250	1245	7.987	8.087	0.040	0.100	0.62
2500	2497	11.990	12.106	0.040	0.115	0.72
3750	3746	15.987	16.118	0.040	0.131	0.82
5000	4984	19.981	20.127	0.040	0.147	0.92
3750	3752	16.006	16.116	0.040	0.110	0.69
2500	2501	12.003	12.102	0.040	0.099	0.62
1250	1256	8.019	8.084	0.040	0.065	0.40
0	0	4.000	4.067	0.040	0.067	0.42

=== As Found Calibration Data End ===

Calibration Data - As Left

Max Error: 0.92 %

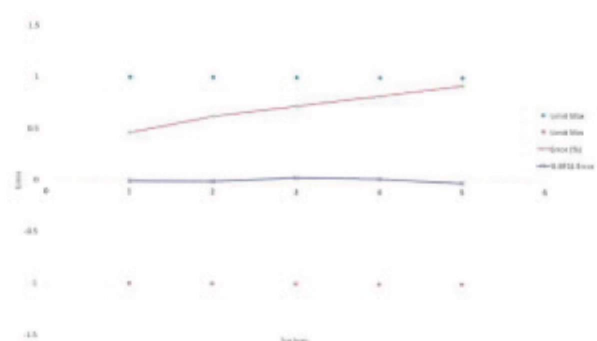
Test Point	Limit Max	Limit Min	SetPoints psi	Reference psi	Nominal mA	Reference mA	Tolerance mA	Deviation mA	Error (%)	BFSL
1	1	-1	0	0	4.000	4.074	0.040	0.074	0.46	4.0746
2	1	-1	1250	1246	7.987	8.087	0.040	0.100	0.62	8.0884
3	1	-1	2500	2497	11.990	12.106	0.040	0.115	0.72	12.1023
4	1	-1	3750	3746	15.987	16.118	0.040	0.131	0.82	16.1162
5	1	-1	5000	4994	19.981	20.127	0.040	0.147	0.92	20.1301
6	1	-1	3750	3752	16.008	16.116	0.040	0.110	0.69	16.1162
7	1	-1	2500	2501	12.003	12.102	0.040	0.098	0.62	
8	1	-1	1250	1256	8.019	8.084	0.040	0.065	0.40	
9	1	-1	0	0	4.000	4.067	0.040	0.067	0.42	

=== As Left Calibration Data End ===

References

Manufacturer	Model	Serial Number	Certificate No.	Due Date	Accuracy
Additel Corporation	ADT681 (0~10000)PSI	211H16920048	234808	4/30/2022	0.05%
—	—	—	—	—	—
LA CROSSE	384107	TX141TH-BV2	5399219	1/11/2022	(+/-)2F 1RH

BFSL ERROR: 0.024



REDACTED PII

Inspector
All inspections are traceable to the National Institute of Standards and Technology. The Calibration & Certifications have been performed to Specialloy's Quality & Laboratory Procedures. All Calibration Equipment used per ANSI/NCSL Z540-1-1994