

# Storage Tank Visual Inspection Report

**Equip Id** 62066541 **SAP ID** 62066541 **Asset Type** Storage Tank  
**Plant** Lloydminster Production **Unit** H1-01-006 MORGAN **System** 00002 MORGAN  
10-34-051-04W4  
TREATING  
FACILITY  
**Description** TANK, FIELD 3000 BBL  
**FLOC** H1-01-006-00002 **LSD** 10-34-051-04W4  
**Insp Date** Jun 15, 2016 **Inspector** Ranger Inspection **Insp Type** VIExt  
**Company** **Confidence**

## Details

ID	Description	Condition	Location	NCR	Comment
T6	Ladder/Stairway	Fair			Acceptable
T7	Platform	Fair			Acceptable
T8	Electrical Ground	Yes			Acceptable
T12	Level Gauge	Yes			Acceptable
T13	Bottom	Fair			Acceptable
T14	Secondary Containment	No			
T15	Shell	Fair			Acceptable
T16	Roof	Fair			Acceptable
T32	Foundation	Fair			Dirt and gravel on tank floor lip.
T41	Connections Other (Please explain)	Fair			Associated Piping - Acceptable
T43	Nozzles	Fair			Acceptable
T46	Manways/Hatches	Fair			Acceptable
T49	Bolting	Fair			Acceptable
T50	Flanges	Fair			Acceptable
T61	Insulation Other (Please explain)	Fair			Several joints of the cladding covering the insulation are not properly sealed.

## Summary

This tank was inspected by Ranger Inspections Ltd. Recommendations and Inspection Intervals are the results of interpreting the data Ranger collected (UT readings) and comments made. For complete details see Rangers Report for Job #22669.  
The tanks external surfaces were found to be in fair condition.  
The cladding covering the insulation was found to be in fair condition with although there were several joints of the cladding which were not properly sealed.  
The tank base is in fair condition however there was some dirt, gravel etc. found on the tank floor lip. In addition there is no liner under the tank floor and there is no secondary containment.  
The tank's associated piping was found to be properly aligned and well supported.

Recommendations:

The joints of the cladding should be properly sealed to prevent moisture from entering and damaging the insulation.  
Remove the dirt gravel etc. from the tank floor lip.

See attached Internal Visual Inspection report for additional details and recommendations.

cc: Marc Case. Jessica Derouin, Lyle Nerbas

## Storage Tank Visual Inspection Report

**Equip Id** 62066541 **SAP ID** 62066541 **Asset Type** Storage Tank  
**Plant** Lloydminster Production **Unit** H1-01-006 MORGAN **System** 00002 MORGAN  
10-34-051-04W4  
TREATING  
FACILITY  
**Description** TANK, FIELD 3000 BBL  
**FLOC** H1-01-006-00002 **LSD** 10-34-051-04W4  
**Insp Date** Jun 15, 2016 **Inspector** Ranger Inspections **Insp Type** VIIInt  
**Company** **Confidence** Medium

### Details

ID	Description	Condition	Location	NCR	Comment
V2	Corrosion	Yes			Underside of tank floor.
V7	Welds	Fair			Acceptable
V8	Nozzles	Fair			Acceptable
V9	Shell	Fair			Acceptable
V10	Roof	Fair			Acceptable
V21	Internals Other (Please explain)	Fair			Internal piping (risers) - Acceptable
T11	Floor	Fair			Minor repairs required

### Summary

Visual inspection of the tanks internal surfaces revealed several areas with minor mechanical damage to the floor likely from stinging the tank. These areas were marked out for immediate repair and repaired by L&L Oilfield of Lloydminster. The internal piping (risers) were found to be in fair to good condition. A Magnetic Flux Leakage (MFL) scan was performed by Ranger Inspections on accessible areas of the tank floor with twenty two (22) indications of underside material loss identified. The minimum thickness found was 0.131 inch. The nominal thickness is 0.250 inch. See attached Ranger Report for Job #22669 for complete details.

#### Recommendations:

Continue the Magnetic Flux Leakage (MFL) scan at the next scheduled inspection.

cc: Marc Case. Jessica Derouin, Lyle Nerbass



## 62066541 Equipment Detail

<b>Plant</b>	Lloydminster Production	<b>Unit</b>	H1-01-006 MORGAN	<b>System</b>	00002 MORGAN 10-34-051-04W4 TREATING FACILITY
<b>SAP ID</b>	62066541	<b>Equip Id</b>	62066541	<b>Asset Type</b>	Storage Tank
<b>Description</b>	TANK, FIELD 3000 BBL				
<b>Manuf.</b>	UNIVERSAL INDUSTRIES	<b>Serial #</b>	95-1026-9224	<b>Year Built</b>	1993
<b>Const Code</b>		<b>Int.Access</b>		<b>Prov #</b>	
<b>Cost Ctr</b>		<b>FLOC</b>	H1-01-006-00002	<b>LSD</b>	10-34-051-04W4
<b>Time Based</b>	Y	<b>Opt RI Grp</b>	AST Cat 1a	<b>CRN</b>	
<b>User Status</b>	ISF	<b>Sys Status</b>	INST	<b>Active</b>	Y

### Equipment Protection

#### Inspections

Insp Type	Method	Insp Date	Inspection	Company	Confidence
VIInt		Jun 15, 2016	Ranger Inspections		Medium
VIExt		Jun 15, 2016	Ranger Inspection		
VIExt		Oct 05, 2011	Ray Trachuk	Husky Energy	High
VIInt		Oct 05, 2011	Ray Trachuk	Husky Energy	

#### Inspection Plan

**Planned By:** Ray Trachuk      **Planning Date:** Jul 07, 2016

Dmg Mech	Method	Due Date	Freq	SAP Not #	SAP W.O. #
External Deterioration	VI-Ext	Jun 14, 2021	5		
Internal Corrosion	VI-Int	Jun 14, 2021	5		
Internal Corrosion	UT	Jun 14, 2021	5		



62066541

**ABOVE GROUND STORAGE TANK  
API STANDARD 653  
OUT-OF-SERVICE  
FINAL INSPECTION REPORT  
RANGER INSPECTION™  
JOB # 22669  
(Revision 1)**

**HUSKY ENERGY**

**MORGAN BATTERY  
LSD: 10-34-051-04 W4M**

**TANK # T-107A**

**INSPECTION DATE: JUNE 14 / 2016**

Prepared by:



**#130 – 11051 – 50<sup>th</sup> Street SE  
Calgary, Alberta Canada T2C 3E5  
Tel: (403) 252-4487 Fax: (403) 257-4756  
[www.rangerinspection.com](http://www.rangerinspection.com)**

---

## **EXECUTIVE SUMMARY**

The following is a summary of the major findings of the out-of-service inspection performed on Tank # T-107A:

### **BOTTOM**

- 1.) A Magnetic Flux Leakage (MFL) scan was performed on accessible areas of the tank bottom plate. Twenty two (22) indications of underside material loss were identified.
- 2.) Resulting MFL indications were additionally evaluated with ultrasonics (UT). The minimum thickness found was 0.131 inch. The nominal thickness is 0.250 inch.
- 3.) The bottom plate was visually examined for topside pitting. Ten (10) pits up to 0.250 inch deep and one (1) hole were observed throughout the tank bottom. This material loss is believed to be from a stinger and is abrasion material loss; however, for the purpose of bottom calculations the material loss will be treated as corrosion.
- 4.) Inspection was limited on the bottom lap welds due to the presence of water and product.

### **SHELL-TO-BOTTOM WELD INSPECTION RESULTS AND EVALUATION**

- 1.) A limited visual inspection was performed on the shell-to-bottom weld internally, due to the presence of water and product. Accessible areas were observed to be in acceptable condition.
- 2.) Externally, the weld could not be inspected due to insulation.

---

## **FOUNDATION**

- 1.) The foundation was visually examined from accessible areas. The tank was observed to be resting within a slightly elevated, or even with grade, metal ring on an earth and gravel foundation.
- 2.) Vegetation growth was observed throughout the metal ring adjacent to the bottom plate projection.
- 3.) A void was observed beneath the bottom plate around the manway due to the cleaning process.
- 4.) No berm was observed; however, there is a low point in the battery in the northwest corner that would collect any product if it were to leak.

## **SHELL**

- 1.) The shell plate was visually examined and observed to be insulated. Some areas of sealant failures were present around nozzles.
- 2.) Internally, the visual inspection was limited due to product. Exposed areas were observed to be in acceptable condition at the period of this inspection.
- 3.) Random ultrasonic thickness (UT) readings were taken on the first course shell plate. No significant material loss was observed or recorded. Refer to Table A - Manual UT Shell Plate Readings – Course # 1, for additional data.

## **NOZZLES AND APPURTENANCES**

- 1.) The tank nozzles and appurtenances were visually examined. Inspection was limited due to insulation. All exposed nozzles were observed to be in acceptable condition.
- 2.) Internally, inspection was limited due to product. The manway was observed to have one (1) pinhole and one (1) 6 inch length of corrosion on the toe of the manway neck weld. Refer to photographs.

**FIXED ROOF**

- 1.) A visual inspection was performed on the roof externally. The roof was observed to be foam insulated.
- 2.) The gauge hatch seal was observed to be in deteriorating condition.
- 3.) Internally, the roof plate was visually inspected from the bottom. Areas of oxidation could be seen at the period of this inspection.

---

## **REPAIR RECOMMENDATIONS**

### **BOTTOM**

- 1.) The following is recommended to allow the tank to return to service for a 5 year run:
  - a.) 18 inch \* 8 inch patch covering topside pitting (0.250, 0.110, 0.080, 0.040 inch)
  - b.) 9 inch round patch covering topside pitting (0.150 inch)
  - c.) 6 inch round patch covering topside pitting (hole through, 0.050 inch)
  - d.) Lace weld topside pitting (0.090 inch)
  - e.) 3 separate puddle welds (0.050, 0.040, 0.040 inch)

### **SHELL-TO-BOTTOM WELD**

- 1.) No shell-to-bottom weld repairs are recommended at the period of this inspection.

### **FOUNDATION**

- 1.) It is recommended to repack the area of the foundation void beneath the manway.
- 2.) Consideration should be given to reworking the foundation so water is directed away from the bottom plate around the entire perimeter of the tank.

### **SHELL**

- 1.) It is recommended to repair the areas of sealant failure around the nozzles.

### **NOZZLES AND APPURTENANCES**

- 1.) It is recommended to weld repair the pinhole and corrosion located on the manway neck welds.

### **FIXED ROOF**

- 1.) Consideration should be given to replacing the gauge hatch seal.

## SUMMARY CALCULATIONS

$$MRT = (\text{Minimum of } RT_{BC} \text{ or } RT_{ip}) - O_r (StP_r + UP_r)$$

**Where:**

$MRT$  = minimum remaining thickness at the end of interval  $O_r$ .

$O_r$  = in service interval of operation (as specified by owner or governed by inspection results).

$RT_{BC}$  = minimum remaining thickness from bottom side corrosion.

$RT_{ip}$  = minimum remaining thickness from internal corrosion.

$StP_r$  = maximum rate of corrosion not repaired on the top side.  $StP_r = 0$  for coated areas of the bottom.

$UP_r$  = maximum rate of corrosion on the bottom side.

$StP_r = (\text{nominal thickness} - RT_{ip}) / (\text{Age of tank})$

$UP_r = (\text{nominal thickness} - RT_{BC}) / (\text{Age of tank})$

**The bottom plate of Tank # T-107A is 21 years old.**

RESULTS WITHOUT REPAIRS			RESULTS AFTER RECOMMENDED REPAIRS	
$RT_{BC}$	0.131	inch	0.131	inch
$RT_{ip}$	Hole through	inch	0.250	inch
$O_r$	5	years	5	years
$StP_r$	Hole through	inch/yr	0	inch/yr
$UP_r$	0.00567	inch/yr	0.00567	inch/yr
$MRT$	Hole through	inch	0.103	inch
Required Thickness at $O_r$	0.100	inch	0.100	inch

*All topside areas of material loss were identified for repair in the repair recommendations on the previous page.*

---

## **TABLE OF CONTENTS**

EXECUTIVE SUMMARY .....	2
REPAIR RECOMMENDATIONS.....	5
SUMMARY CALCULATIONS .....	7
1. INTRODUCTION.....	12
2. JOB DESCRIPTION.....	13
3. TANK DESCRIPTION .....	14
4. FITNESS FOR SERVICE .....	15
5. OVERVIEW .....	16
5.1 OVERALL INSPECTION CHECKLIST .....	16
5.2 OVERVIEW PHOTOGRAPHS.....	17
6. BOTTOM.....	20
6.1 BOTTOM CHECKLIST .....	20
6.2 BOTTOM PLATE LAYOUT DRAWINGS .....	21
6.3 BOTTOM PHOTOGRAPHS.....	23
7. FOUNDATION.....	32
7.1 FOUNDATION CHECKLIST .....	32
7.2 FOUNDATION PHOTOGRAPHS .....	34
8. SHELL .....	36
8.1 SHELL CHECKLIST .....	36
8.2 SHELL ULTRASONIC THICKNESS READINGS .....	37
8.3 SHELL PLATE PHOTOGRAPHS .....	38
9. NOZZLES AND APPURTENANCES .....	40
9.1 NOZZLE AND APPURTENANCE IN-SERVICE CHECKLIST .....	40
9.2 TANK APPURTENANCE OUT-OF-SERVICE CHECKLIST .....	41
9.3 ACCESS STRUCTURES CHECKLIST .....	42
9.4 NOZZLES AND APPURTENANCES PHOTOGRAPHS.....	43
10. FIXED ROOF .....	53
10.1 FIXED ROOF CHECKLIST .....	53
10.2 FIXED ROOF PHOTOGRAPHS .....	55
11. LIMITATIONS TO NDE EXAMINATION .....	58
12. NDE EQUIPMENT .....	59
13. WARRANTY .....	60



---

## **LIST OF TABLES**

TABLE A -	MANUAL UT SHELL PLATE READINGS – COURSE # 1 .....	37
-----------	---	----

---

## **LIST OF PHOTOGRAPHS**

Photograph #1:	Morgan Battery   LSD: 10-34-051-04 W4M .....	17
Photograph #2:	Tank ID .....	17
Photograph #3:	Nameplate .....	18
Photograph #4:	Overview .....	18
Photograph #5:	Overview .....	19
Photograph #6:	Internal Shell-to-Bottom Weld .....	23
Photograph #7:	Bottom Overview .....	23
Photograph #8:	Bottom Overview .....	24
Photograph #9:	Bottom Overview .....	24
Photograph #10:	Lap Welded Bottom Plate .....	25
Photograph #11:	Topside Pitting (Suspect Mechanical Damage) .....	25
Photograph #12:	0.250 inch Deep Pit.....	26
Photograph #13:	Topside Pitting (Suspect Mechanical Damage) .....	26
Photograph #14:	Hole Through .....	27
Photograph #15:	MFL Indications.....	27
Photograph #16:	MFL Indication   Minimum UT 0.131 inch.....	28
Photograph #17:	18 * 8 inch Recommended Patch .....	28
Photograph #18:	9inInch Round Recommended Patch .....	29
Photograph #19:	6 inch Round Recommended Patch .....	29
Photograph #20:	Lace Weld Repair .....	30
Photograph #21:	Puddle Weld Repair .....	30
Photograph #22:	Puddle Weld Repair .....	31
Photograph #23:	Puddle Weld Repair .....	31
Photograph #24:	Elevated Foundation .....	34
Photograph #25:	Vegetation Growth around Perimeter .....	34
Photograph #26:	Void Beneath Manway from Cleaning.....	35
Photograph #27:	Insulated Shell Plate .....	38
Photograph #28:	Sealant Failures .....	38
Photograph #29:	Internal Shell Plate.....	39
Photograph #30:	Nameplate Manway .....	43

---

Photograph #31: Nozzle / Valve .....	43
Photograph #32: Temperature Gauge.....	44
Photograph #33: Vertical Ladder .....	44
Photograph #34: Gauge Board.....	45
Photograph #35: Nozzles / Piping .....	45
Photograph #36: Nozzles / Piping .....	46
Photograph #37: Valve .....	46
Photograph #38: Valve .....	47
Photograph #39: Internal of Manway.....	47
Photograph #40: Pinhole on Manway Weld .....	48
Photograph #41: Corrosion on Manway Weld.....	48
Photograph #42: Nozzle .....	49
Photograph #43: Nozzles .....	49
Photograph #44: Temperature Probe .....	50
Photograph #45: Nozzle .....	50
Photograph #46: Nozzle .....	51
Photograph #47: Manway Weld Repair .....	51
Photograph #48: Manway Weld Repair.....	52
Photograph #49: Roof Overview .....	55
Photograph #50: Roof Overview .....	55
Photograph #51: Roof Overview .....	56
Photograph #52: Gauge Hatch.....	56
Photograph #53: Underside of Roof Plate .....	57

---

## **1. INTRODUCTION**

Husky Energy contracted with Ranger Inspection™ to provide API Standard 653 inspection services for the above ground storage tank # T-107A as per the Husky Energy representative Mr. Marc Case.

Ranger Inspection™ job number 22669.

The tank is located at the Morgan Battery, LSD: 10-34-051-04 W4M.

This report documents the findings of the out-of-service examinations performed on June 14 / 2016 and provides an evaluation of the inspection results per the applicable criteria of API Standard 653.

Ranger Inspection™ provided the following personnel:

**William Meldrum**

Project Manager / API Inspector / NACE Level II / Report Author  
API 653 Certification # 39083  
NACE Certification # 50049

**Kyle Christensen**

MFE Operator

**Jennifer Thompson**

Technical Report Writer / AutoCAD Draftsperson

## **2. JOB DESCRIPTION**

<b>RANGER JOB NUMBER:</b>	<ul style="list-style-type: none"><li>• 22669</li></ul>
<b>RANGER TAG NUMBER:</b>	<ul style="list-style-type: none"><li>• 12098</li></ul>
<b>TANK NUMBER:</b>	<ul style="list-style-type: none"><li>• T-107A</li></ul>
<b>TANK LOCATION:</b>	<ul style="list-style-type: none"><li>• Morgan Battery</li><li>• LSD: 10-34-051-04 W4M</li></ul>
<b>TANK OWNER:</b>	<ul style="list-style-type: none"><li>• Husky Energy</li></ul>
<b>CUSTOMER CONTACT:</b>	<ul style="list-style-type: none"><li>• Marc Case</li><li>• Husky Energy</li><li>• Phone: 780-205-2377</li><li>• Email: marc.case@huskyenergy.com</li></ul>
<b>SCOPE OF INSPECTION:</b>	<ul style="list-style-type: none"><li>• API 653 Out-of-Service</li></ul>
<b>API INSPECTION DATE:</b>	<ul style="list-style-type: none"><li>• June 14 / 2016</li></ul>
<b>REVISION DATE:</b>	<ul style="list-style-type: none"><li>• Wednesday, June 22, 2016</li></ul>
<b>API INSPECTION COMPANY:</b>	<ul style="list-style-type: none"><li>• Ranger Inspection™</li><li>• #130 – 11051 – 50<sup>th</sup> Street SE</li><li>• Calgary, Alberta</li><li>• Canada T2C 3E5</li><li>• Bus: 403-252-4487</li><li>• Fax: 403-257-4756</li><li>• www.rangerinspection.com</li></ul>
<b>API STANDARD 653 INSPECTOR:</b>	<ul style="list-style-type: none"><li>• William Meldrum</li><li>• Certification # 39083</li></ul>

### 3. TANK DESCRIPTION

Nameplate Details	TANK NUMBER / ID:	• T-107A
	RANGER TAG NUMBER:	• 12098
	TANK MANUFACTURER'S SERIAL NUMBER:	• 95 1026 9224
	MANUFACTURER:	• Universal Industries LTD.
	TANK OWNER / OPERATOR:	• Husky Energy
	NAMEPLATE PRESENT:	• Yes
	DESIGN STD:	• API, Edition 1993
	YEAR BUILT:	• 1995
	TANK LOCATION:	• Morgan Battery • LSD: 10-34-051-04 W4M
	SERVICE:	• Sweet Crude Oil
	DIAMETER:	• 30 feet
	HEIGHT:	• 24 feet
	NOMINAL CAPACITY:	• 3000 BBL
	FLOOR THICKNESS:	• ¼ inch
	ROOF THICKNESS:	• 3/16 inch
	SHELL THICKNESS:	• Course 1, 2, 3 = 3/16 inch
	DESIGN PRESSURE:	• -4 oz / -14 vac
Tank Geometry	FOUNDATION DETAIL:	• Elevated earth and gravel in metal ring
	BOTTOM PLATES:	• Bottom Plate Projection = No access • Weld Detail = Lap welded • Nominal Plate Thickness = 0.250 inch
	SHELL PLATES:	• Weld Detail = Butt welded
	FIXED ROOF:	• Plate Thickness = 0.188 inch
	FIXED ROOF ACCESS:	• Vertical Ladder
Coating Details	BOTTOM PLATE COATING:	• Internal Coating = No coating
	SHELL PLATE COATING:	• Internal Coating = No coating • External Coating = Insulation
	FIXED ROOF PLATE COATING:	• Internal Coating = No coating • External Coating = Insulation

## **4. FITNESS FOR SERVICE**

Based on the findings of this inspection, Tank # T-107A is fit to be returned to service upon completion of the recommended repairs as documented in this report. All required post repair NDE as specified in applicable codes and standards shall be performed and documented.

**William Meldrum**

API Standard 653 Inspector

Certification # 39083

## **5. OVERVIEW**

### **5.1 OVERALL INSPECTION CHECKLIST**

✓	✖	N/A	#	Description	Comments
✓			1	Check that tank has been cleaned, is gas free, and safe for entry.	• Acceptable
✓			2	Check that the tank is completely isolated from product lines, all electrical power, and steam lines.	• Acceptable
✓			3	Check that roof is adequately supported, including fixed roof structure and floating roof legs.	• Acceptable
✓			4	Check for presence of falling object hazards, such as corroded-through roof rafters, asphalt stalactites, and trapped hydrocarbons in unopened or plugged equipment or appurtenances, ledges, etc.	• Acceptable
✓			5	Inspect for slipping hazards on the bottom and roof decks.	• Acceptable
		N/A	6	Inspect structural welds on access ways and clips.	• N/A
✓			7	Check surfaces needing inspection for a heavy-scale buildup and check weld seams and oily surfaces where welding is to be done. Note the areas in need of additional cleaning, including blasting.	• Acceptable
✓ = In – Compliance / Acceptable				✖ = Out of Compliance / Area of Concern	N/A = Not Applicable

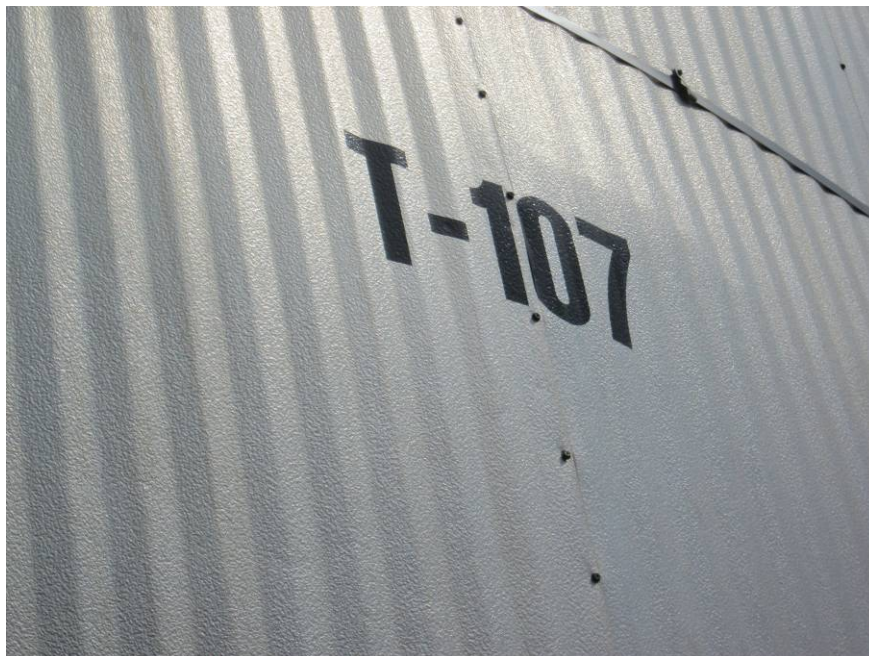


## 5.2 OVERVIEW PHOTOGRAPHS

The following digital photographs of the tank were taken at the period of this inspection:



Photograph #1: Morgan Battery | LSD: 10-34-051-04 W4M



Photograph #2: Tank ID

FABRICATED BY UNIVERSAL INDUSTRIES LTD. LLOYDMINSTER, SASK./ALTA.			
APPENDIX		YEAR COMPLETED	1995
EDITION	1995	DESIGN PRESSURE	402 PSI VAC
NOMINAL DIAMETER	30'	DESIGN LIQUID LEVEL	
NOMINAL HEIGHT	24'	MAX. OPERATING TEMP.	
NOMINAL CAPACITY	3000 BBL	PARTIAL STRESS RELIEF	
FLOOR THICKNESS	1 1/4"	SERIAL NO.	95 10 26 9224
ROOF THICKNESS	3/16"	PURCHASER'S TANK NO.	
SHELL	COURSE 1	COURSE 4	
	COURSE 2	COURSE 5	
	COURSE 3	COURSE 6	
JOB 6787			

Photograph #3: Nameplate



Photograph #4: Overview



**Photograph #5: Overview**



## 6. BOTTOM

### 6.1 BOTTOM CHECKLIST

✓	✗	N/A	#	Description	Comments
✓			1	Nominal bottom plate thickness.	• 0.250 inch
	✗		2	Minimum remaining material thickness of bottom plates (UT reading). <input type="checkbox"/> UT THROUGH COATING / <input checked="" type="checkbox"/> UT ON BARE STEEL	• 0.131 inch
	✗		3	Maximum product side pit depth on bottom plates.	• Hole through
		N/A	4	Coating thickness and detail on bottom plates. (Fiberglass or Epoxy).	• N/A • No coating
		N/A	5	Inspect coating for holes, disbonding, deterioration, and discoloration.	• N/A
✓			6	Using a flashlight held close to and parallel to the bottom plates, and using the bottom plate layout as a guide—visually inspect and hammer test the entire region.	• MFL / UT performed
	✗		7	Measure the depth of pitting and describe the pitting appearance. (sharp edged, lake type, dense, scattered, etc.)	• Isolated pitting • Believed to be mechanical damage
✓			8	Mark areas requiring patching or further inspection.	• Refer to Bottom Plate Layout drawing
✓			9	Mark locations for turning coupons for inspection.	• Refer to Bottom Plate Layout drawing
✓			10	Inspect all welds for corrosion and leaks, particularly the shell-to-bottom weld.	• Limited • Exposed areas visually acceptable
✓			11	Inspect sketch plates for corrosion.	• MFL / UT performed
		N/A	12	Check condition of internal sump, if applicable. Sump bottom and sidewall plate and seams need to be evaluated for both product-side and soil-side corrosion.	• N/A
	✗		13	Locate and mark voids under the bottom.	• Void beneath manway due to cleaning
✓			14	Record bottom data on a layout sketch using the existing bottom plates as a grid. List the number and sizes of patches required.	• Refer to Bottom Plate Layout drawing
		N/A	15	Vacuum test the bottom lap welds.	• N/A
		N/A	16	Hammer test or ultrasonically examine any slightly discolored spots or damp areas.	• N/A
		N/A	17	Check for reinforcing pads under all bottom attached clips, brackets and supports.	• N/A
		N/A	18	Check the column bases of fixed roof supports for adequate pads and restraining clips.	• N/A
		N/A	19	In earthquake zones 3 and 4, check that roof supports are not welded down to the tank bottom, but are only restrained from horizontal movement.	• N/A
		N/A	20	Mark old oil and air test connection for removal and patching.	• N/A
✓			21	Identify and report low areas on the bottom that do not drain adequately.	• Acceptable
✓			22	Bottom plate slope (Flat, cone-up, cone-down).	• Flat
✓ = In – Compliance / Acceptable				✗ = Out of Compliance / Area of Concern	N/A = Not Applicable

---

## **6.2 BOTTOM PLATE LAYOUT DRAWINGS**

---

### **LIST OF BOTTOM PLATE DRAWINGS**

---

Drawing # 1 of 1 – Bottom Plate Layout



### **6.3 BOTTOM PHOTOGRAPHS**

The following digital photographs of the bottom were taken at the period of this inspection:



**Photograph #6: Internal Shell-to-Bottom Weld**



**Photograph #7: Bottom Overview**





**Photograph #8: Bottom Overview**



**Photograph #9: Bottom Overview**

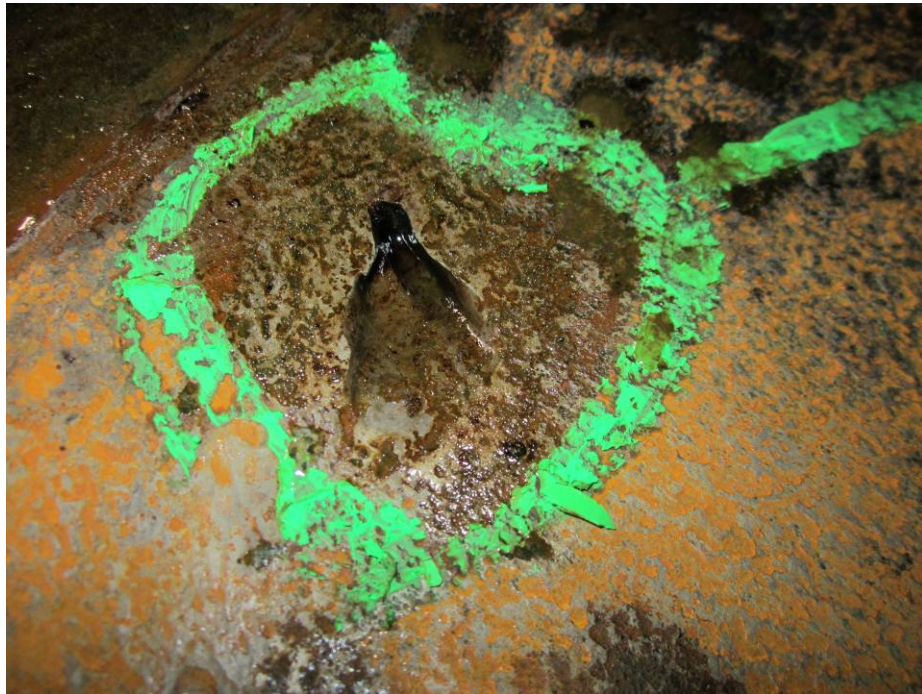




**Photograph #10: Lap Welded Bottom Plate**



**Photograph #11: Topside Pitting (Suspect Mechanical Damage)**



Photograph #12: 0.250 inch Deep Pit



Photograph #13: Topside Pitting (Suspect Mechanical Damage)





Photograph #14: Hole Through



Photograph #15: MFL Indications



Photograph #16:MFL Indication | Minimum UT 0.131 inch

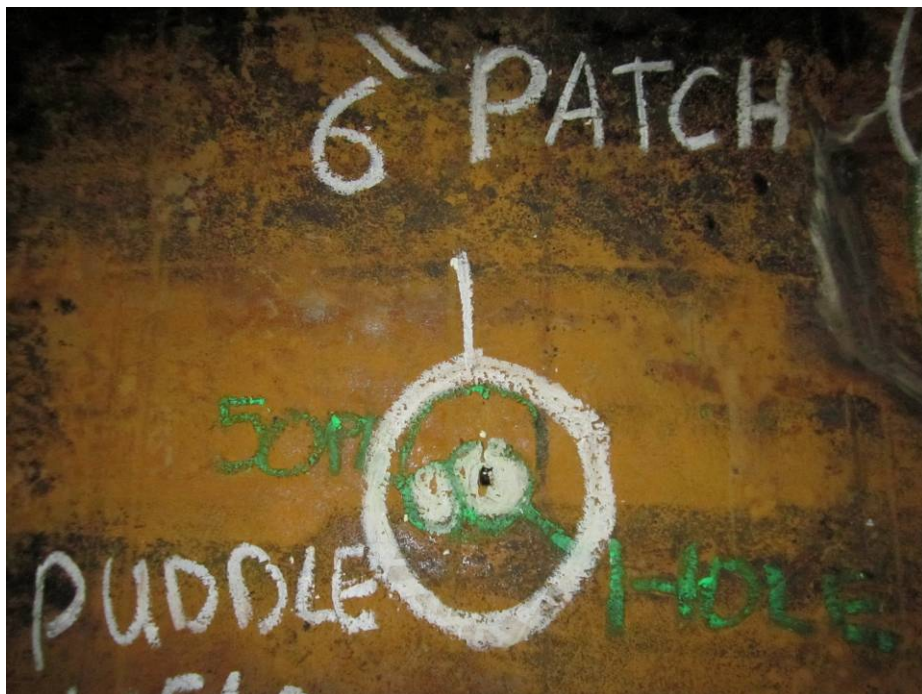


Photograph #17:18 \* 8 inch Recommended Patch

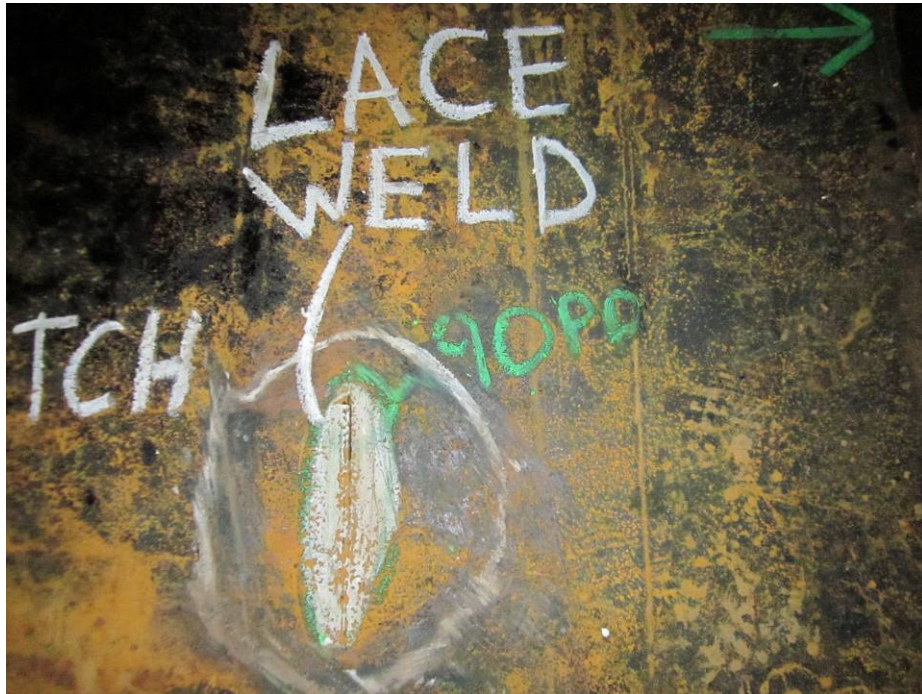




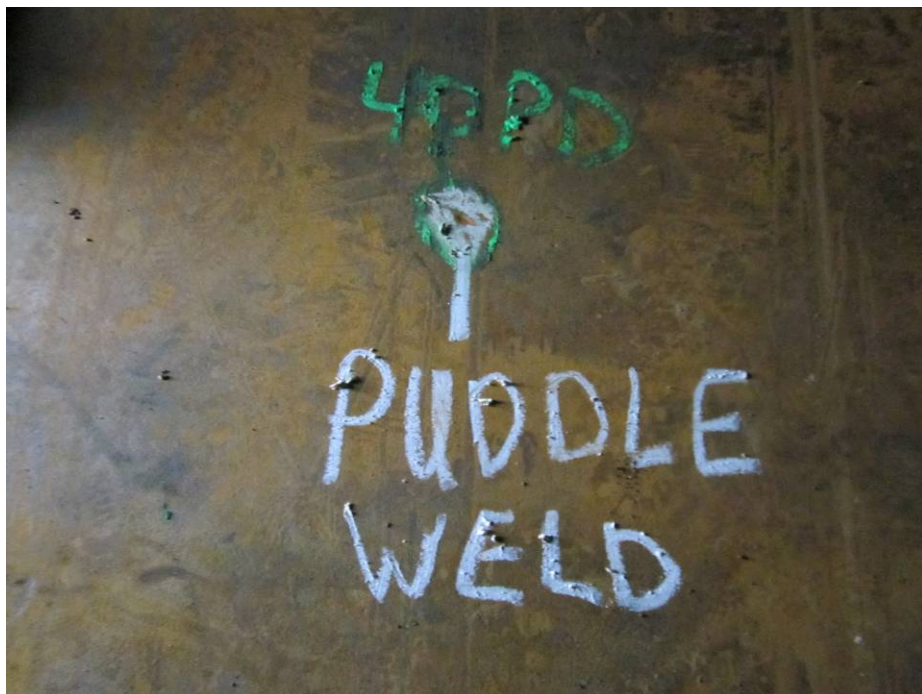
Photograph #18: 9 inch Round Recommended Patch



Photograph #19: 6 inch Round Recommended Patch

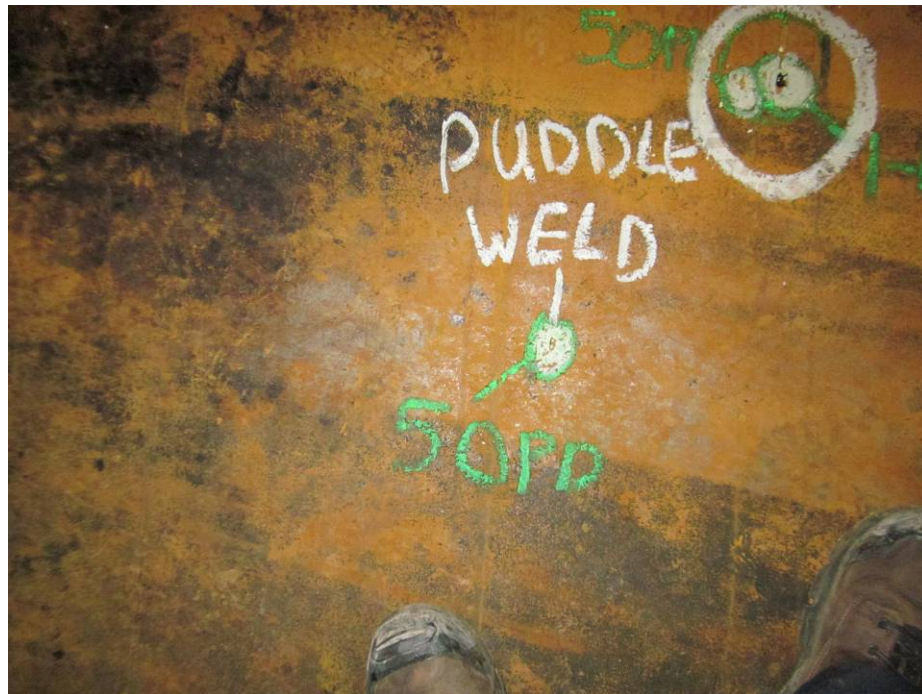


Photograph #20:Lace Weld Repair

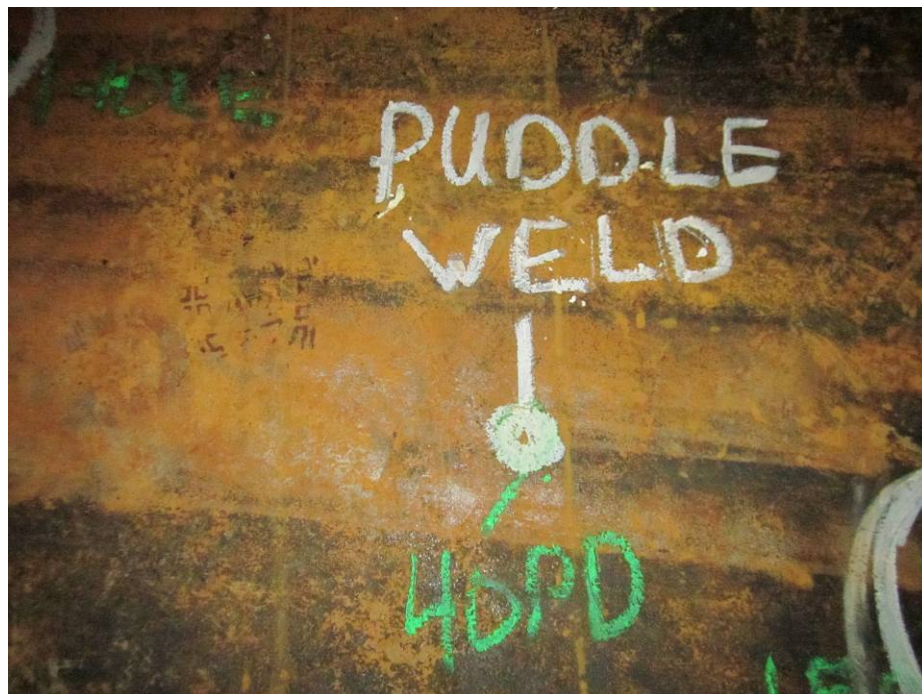


Photograph #21:Puddle Weld Repair





Photograph #22:Puddle Weld Repair



Photograph #23:Puddle Weld Repair

## 7. FOUNDATION

### 7.1 FOUNDATION CHECKLIST

✓	✗	N/A	#	Description	Comments
<b>A. External Foundation</b>					
✓			1	Measure foundation levelness and bottom evaluations (see API Standard 653, Annex B for extent of measurements).	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
		N/A	2	Shared or Single cell berm.	<ul style="list-style-type: none"> <li>N/A</li> <li>None present</li> </ul>
		N/A	3	Condition of sloped berm walls.	<ul style="list-style-type: none"> <li>N/A</li> <li>None present</li> </ul>
		N/A	4	Condition of concrete berm.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	5	Condition of secondary liner.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
	✗		6	Elevation of tank above grade of foundation.	<ul style="list-style-type: none"> <li>Above or even with grade</li> </ul>
		N/A	7	Condition of asphalt skirt.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	8	Inspect the bottom-to-foundation seal, if present.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			9	Clean off the bottom angle area and inspect for corrosion and thinning on plate and weld.	<ul style="list-style-type: none"> <li>Visually acceptable in sample areas</li> </ul>
<b>B. Internal Foundation</b>					
		N/A	10	Bottom plate edge settlement.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	11	Distance to break over point	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	12	Allowable bottom plate edge settlement	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	13	75% of maximum allowable bottom plate edge settlement.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>C. Concrete Ring</b>					
		N/A	14	Inspect for broken concrete, spalling, and cracks; particularly under backup bars used in welding butt-welded annular rings under the shell.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	15	Trough present around perimeter of bottom plate?	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	16	Inspect drain openings in ring, back of waterdraw basins and top surface of ring for indications of bottom leakage.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	17	Inspect for cavities under foundation and vegetation against bottom of tank.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	18	Check that runoff rainwater from the shell drains away from the tank.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	19	Check for settlement around perimeter of tank.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓ = In – Compliance / Acceptable			✗ = Out of Compliance / Area of Concern		N/A = Not Applicable



**Continuation of the Foundation Checklist**

✓	✘	N/A	#	Description	Comments
<b>D. Asphalt</b>					
		N/A	20	Check for settling of tank into asphalt base which would direct runoff rain water under the tank instead of away from it.	• N/A
		N/A	21	Look for areas where leaching of oil has left rock filler exposed, which indicates hydrocarbon leakage.	• N/A
<b>E. Oiled Dirt or Sand</b>					
	✘		22	Check for settlement into the base which would direct runoff rain water under the tank rather than away from it.	• Possible runoff water directed beneath tank
<b>F. Rock</b>					
	✘		23	Presence of crushed rock under the steel bottom usually results in severe underside material loss. Make a note to do additional bottom plate examination (ultrasonic, hammer testing, or turning of coupons) when the tank is out-of-service.	<ul style="list-style-type: none"> <li>• MFL / UT performed</li> <li>• 0.131 inch minimum thickness observed</li> </ul>
<b>G. Site Drainage</b>					
✓			24	Check site for drainage away from the tank and associated piping and manifolds.	• Acceptable
		N/A	25	Check operating condition of the dike drains.	• N/A
<b>H. Housekeeping</b>					
✓			26	Inspect the area for buildup of trash, vegetation, and other inflammables.	• Acceptable
✓ = In – Compliance / Acceptable				✘ = Out of Compliance / Area of Concern	N/A = Not Applicable

## **7.2 FOUNDATION PHOTOGRAPHS**

The following digital photographs of the foundation were taken at the period of this inspection:



**Photograph #24: Elevated Foundation**



**Photograph #25: Vegetation Growth around Perimeter**



**Photograph #26: Void Beneath Manway from Cleaning**

## 8. SHELL

### 8.1 SHELL CHECKLIST

✓	✖	N/A	#	Description	Comments
✓			1	THICKNESS RANGE RECORDED: (Bare Steel)	<ul style="list-style-type: none"> <li>Course # 1: 0.182 to 0.196 inch</li> </ul>
<b>A. Visual Inspection</b>					
		N/A	2	Internal coating detail.	<ul style="list-style-type: none"> <li>N/A</li> <li>No coating</li> </ul>
✓			3	External coating detail.	<ul style="list-style-type: none"> <li>Insulation</li> </ul>
✓			4	Bulging / shell plate deformation.	<ul style="list-style-type: none"> <li>Visually acceptable from inside</li> </ul>
✓			5	Peaking and banding.	<ul style="list-style-type: none"> <li>Visually acceptable from inside</li> </ul>
✓			6	On cone up bottoms, closely inspect and gauge the depth of metal loss on the lower 2 inches to 4 inches of the shell (area of standing water).	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
✓			7	Measure the depth of pitting on each course.	<ul style="list-style-type: none"> <li>No pitting observed</li> </ul>
		N/A	8	Inspect and estimate the amount of metal loss on the heads of rivets and bolts.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	9	Inspect shell-to-bottom riveted lap joints.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	10	Inspect existing protective coatings for damage, deterioration, and disbonding.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			11	Visually inspect the shell plates and seams for indications of leakage.	<ul style="list-style-type: none"> <li>Visually acceptable through insulation</li> </ul>
		N/A	12	If the shell has riveted or bolted seams, record the leak locations by film or chart in case the locations are lost during surface preparation for painting.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			13	Survey the shell to check for roundness and plumbness.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
		N/A	14	Inspect overflow for corrosion and adequate screening.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	15	Check location of overflow that it is not above any tank valves or equipment.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓ = In – Compliance / Acceptable				✖ = Out of Compliance / Area of Concern	N/A = Not Applicable



## 8.2 SHELL ULTRASONIC THICKNESS READINGS

TABLE A - MANUAL UT SHELL PLATE READINGS – COURSE # 1 (inches)								
<input checked="" type="checkbox"/> UT ON BARE STEEL					<input type="checkbox"/> UT THROUGH COATING			
PLATE NO. / ID	1	2	3	4	5	6	7	8
1	0.185	0.184	0.190	0.186	0.182	0.188	0.191	0.187
2	0.196	0.191	0.193	0.190	0.189	0.195	0.185	0.187
3	0.183	0.185	0.183	0.191	0.187	0.185	0.188	0.190
Minimum:	0.182							
Maximum:	0.196							

**Notes:**

1.) PLATE NO/ID #1 = Reference Manway Item A.

### **8.3 SHELL PLATE PHOTOGRAPHS**

The following digital photographs of the shell were taken at the period of this inspection:



**Photograph #27: Insulated Shell Plate**



**Photograph #28: Sealant Failures**



**Photograph #29:Internal Shell Plate**

## 9. NOZZLES AND APPURTENANCES

### 9.1 NOZZLE AND APPURTENANCE IN-SERVICE CHECKLIST

✓	✕	N/A	#	Description	Comments
<b>A. Manways and Nozzles</b>					
	✕		1	Inspect for cracks or signs of leakage on weld joint at nozzles, manways, and reinforcing plates.	<ul style="list-style-type: none"> <li>Pinhole and corrosion on manway welds</li> </ul>
✓			2	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	<ul style="list-style-type: none"> <li>Visually acceptable internally</li> </ul>
		N/A	3	Inspect for flange leaks and leaks around bolting.	<ul style="list-style-type: none"> <li>N/A</li> <li>OOS inspection</li> </ul>
	✕		4	Inspect sealing of insulation around manways and nozzles.	<ul style="list-style-type: none"> <li>Sealant failures present</li> </ul>
✓			5	Check for inadequate manway flange and cover thickness on mixer manways.	<ul style="list-style-type: none"> <li>Acceptable</li> </ul>
<b>B. Tank Piping Manifolds</b>					
		N/A	6	Inspect manifold piping, flanges and valves for leaks.	<ul style="list-style-type: none"> <li>N/A</li> <li>OOS inspection</li> </ul>
		N/A	7	Inspect fire fighting system components.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			8	Check for anchored piping which would be hazardous to the tank shell or bottom connections during earth movement.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
✓			9	Check sample connections for leaks and for proper valve operation.	<ul style="list-style-type: none"> <li>Present</li> </ul>
✓			10	Check for damage and test the accuracy of temperature indicators.	<ul style="list-style-type: none"> <li>Present</li> </ul>
<b>C. Autogauge System</b>					
		N/A	11	Inspect autogauge tape guide and lower sheave housing (floating swings) for leaks.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	12	Inspect autogauge head for damage.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	13	Bump the checker on autogauge head for proper movement of tape.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			14	Inspect condition of board and legibility of board-type autogauges.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
✓ = In – Compliance / Acceptable				✕ = Out of Compliance / Area of Concern	N/A = Not Applicable



## 9.2 TANK APPURTENANCE OUT-OF-SERVICE CHECKLIST

✓	✕	N/A	#	Description	Comments
<b>A. Sampling Systems: Roof Sample Hatches</b>					
		N/A	1	Inspect roof-mounted sample hatches for reinforcing pads and cracking.	<ul style="list-style-type: none"> <li>No access</li> <li>Insulated</li> </ul>
✓			2	Inspect cover for operation.	<ul style="list-style-type: none"> <li>Acceptable</li> </ul>
	✕		3	For tanks complying with Air Quality Monitoring District rules, inspect sample hatch covers for adequate sealing.	<ul style="list-style-type: none"> <li>Deteriorated seal</li> </ul>
<b>B. Shell Nozzles</b>					
✓			4	Inspect shell nozzles for thinning and pitting.	<ul style="list-style-type: none"> <li>Limited</li> <li>Visually acceptable</li> </ul>
		N/A	5	Inspect hot tap nozzles for trimming of holes.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			6	Identify type of shell nozzles.	<ul style="list-style-type: none"> <li>Refer to photographs and Bottom Plate Layout drawing</li> </ul>
✓			7	Identify and describe internal piping, including elbow-up and elbow-down types.	<ul style="list-style-type: none"> <li>Refer to photographs</li> </ul>
<b>C. For Nozzles Extended into the Tank</b>					
		N/A	8	Inspect pipe support pads welded to the tank bottom.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	9	Inspect to see that pipe is free to move along support without strain or tearing action on bottom plate.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	10	In internal elbow-down fill line nozzles, inspect the wear plate on the tank bottom.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓ = In – Compliance / Acceptable				✕ = Out of Compliance / Area of Concern	N/A = Not Applicable

### 9.3 ACCESS STRUCTURES CHECKLIST

✓	✖	N/A	#	Description	Comments
<b>A. Handrails</b>					
✓			1	Identify and report the type (steel pipe, galvanized pipe, square tube, or angle), and size of handrails.	<ul style="list-style-type: none"> <li>Vertical ladder</li> <li>Visually acceptable</li> </ul>
✓			2	Inspect for pitting, holes, and paint failure.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
✓			3	Inspect attachment welds.	<ul style="list-style-type: none"> <li>Exposed welds acceptable</li> </ul>
✓			4	Identify cold joints and sharp edges. Inspect the handrails and midrails.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
		N/A	5	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>B. Platform Frame</b>					
		N/A	6	Inspect frame for corrosion and paint failure.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	7	Inspect the attachment of frame to supports and supports to tank for corrosion weld failure.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	8	Check reinforcing pads where supports are attached to shell or fixed roof.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	9	Inspect the surface that deck plate or grating rests on, for thinning and holes.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	10	Check that flat-surface-to-flat-surface junctures are seal-welded.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>C. Deck Plate and Grating</b>					
		N/A	11	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	12	Inspect plate-to-frame weld for rust scale buildup.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	13	Inspect grating for corrosion-caused thinning of bars, and failure of welds.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓ = In – Compliance / Acceptable				✖ = Out of Compliance / Area of Concern	N/A = Not Applicable

## **9.4 NOZZLES AND APPURTENANCES PHOTOGRAPHS**

The following digital photographs of the nozzles and appurtenances were taken at the period of this inspection:



**Photograph #30: Nameplate Manway**



**Photograph #31: Nozzle / Valve**



**Photograph #32: Temperature Gauge**



**Photograph #33: Vertical Ladder**





**Photograph #34: Gauge Board**



**Photograph #35: Nozzles / Piping**



**Photograph #36: Nozzles / Piping**



**Photograph #37: Valve**





**Photograph #38:Valve**



**Photograph #39:Internal of Manway**



**Photograph #40: Pinhole on Manway Weld**



**Photograph #41: Corrosion on Manway Weld**





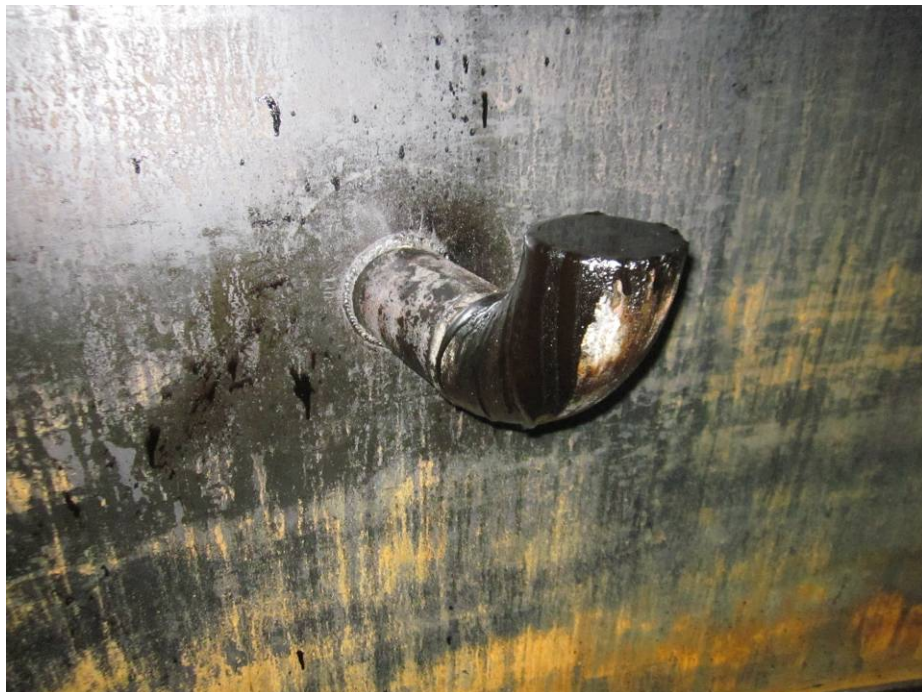
**Photograph #42: Nozzle**



**Photograph #43: Nozzles**



**Photograph #44: Temperature Probe**



**Photograph #45: Nozzle**





**Photograph #46: Nozzle**



**Photograph #47: Manway Weld Repair**



**Photograph #48: Manway Weld Repair**

## 10. FIXED ROOF

### 10.1 FIXED ROOF CHECKLIST

✓	✕	N/A	#	Description	Comments
<b>A. General</b>					
	✕		1	Visually inspect the underside surface of the roof plates for holes, scale buildup, and pitting.	<ul style="list-style-type: none"> <li>Oxidation present</li> </ul>
		N/A	2	Hammer test or ultrasonically examine to check for thin areas, particularly in the vapor space of floating roofs and at edge of roof on cone roof tank.	<ul style="list-style-type: none"> <li>N/A</li> <li>Insulated</li> </ul>
		N/A	3	Check all clips, brackets, braces, etc., welded to the roof deck plate for welded reinforcing pads and see that they have not broken free.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	4	Inspect for protective coating for breaks, disbondment, and deterioration.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
		N/A	5	Spark test the interior surface coating if recoating is not planned.	<ul style="list-style-type: none"> <li>N/A</li> </ul>
✓			6	Photograph the roof structure if no rafter layout drawing exists.	<ul style="list-style-type: none"> <li>Refer to photographs</li> </ul>
<b>B. Deck Plate External Corrosion</b>					
✓			7	Visually inspect for paint failure, holes, pitting, and corrosion product on the roof deck.	<ul style="list-style-type: none"> <li>Insulation visually acceptable</li> </ul>
<b>C. Roof Deck Drainage</b>					
✓			8	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure).	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
<b>D. Roof Insulation</b>					
✓			9	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
✓			10	Inspect for wet insulation under the weather coat.	<ul style="list-style-type: none"> <li>Visually acceptable</li> </ul>
		N/A	11	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	<ul style="list-style-type: none"> <li>Not performed</li> </ul>
✓ = In – Compliance / Acceptable				✕ = Out of Compliance / Area of Concern	N/A = Not Applicable

**Continuation of the Fixed Roof Checklist**

✓	✗	N/A	#	Description	Comments
<b>E. Fixed Roof Support Structure</b>					
		N/A	12	Inspect the support columns for thinning in the upper 2 ft.	• N/A
		N/A	13	On API columns (two channels welded together), check for corrosion scale breaking the tack welds, unless the joint between the channels is completely seal welded.	• N/A
		N/A	14	Check that the reinforcing pad on the bottom is seal-welded to the tank bottom with horizontal movement restraining clips welded to the pad.	• N/A
		N/A	15	Determine if pipe column supports are concrete filled or open pipe. If open pipe, check for drain opening in the bottom of the pipe.	• N/A
		N/A	16	Inspect and gauge rafters for thinning, particularly near the center of the roof. Report metal loss.	• N/A
		N/A	17	Check for loose or twisted rafters.	• N/A
		N/A	18	Inspect girders for thinning and check that they are attached securely to the top of the columns.	• N/A
		N/A	19	Inspect and report presence of any roof-mounted swing line bumpers.	• N/A
<b>F. Sample Hatch</b>					
✓			20	Inspect condition and functioning of sample hatch cover.	• Acceptable
	✗		21	On tanks governed by Air Quality Monitoring District rules, check for the condition of seal inside hatch cover.	• Deteriorated seal
✓			22	Check for corrosion and plugging on thief and gauge hatch cover.	• Acceptable
✓			23	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	• Present
		N/A	24	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	• No access • Insulation
<b>G. Breathers and Vents</b>					
✓			25	Inspect and service the breather.	• Closed system
		N/A	26	Inspect screens on vents and breathers.	• N/A
✓ = In – Compliance / Acceptable				✗ = Out of Compliance / Area of Concern	N/A = Not Applicable



## **10.2 FIXED ROOF PHOTOGRAPHS**

The following digital photographs of the fixed roof were taken at the period of this inspection:



**Photograph #49:Roof Overview**



**Photograph #50:Roof Overview**



**Photograph #51:Roof Overview**



**Photograph #52:Gauge Hatch**





**Photograph #53: Underside of Roof Plate**

---

## **11. LIMITATIONS TO NDE EXAMINATION**

### **LIMITATIONS TO BOTTOM EXAMINATION**

Areas limited or excluded from the MFL floor examination included the shell-to-bottom welds, lap welds, under internal piping, under floating roof leg stands, and the bottom of the sump.

Internal visual examination may have been limited by internal coatings, inadequate cleaning, insufficient lighting, internal column supports, and internal piping.

MFL indications can be falsely triggered by internal pitting, dents, plate buckling, puddle welds, or other previous attachment welds; false MFL indications may be excluded by discretion of the operator. There remains the possibility that underside material loss may be precisely below these aforementioned areas.

### **LIMITATIONS TO FOUNDATION EXAMINATION**

Visual evaluation and settlement surveys may have been limited by ice / snow / earth buildup, standing water, inadequate access to bottom plate projection, insufficient bottom plate projection, external piping, shell insulation, and double bottoms.

### **LIMITATIONS TO SHELL EXAMINATION**

Visual and Ultrasonic examination may have been limited by shell coatings, insulation, wind girders, and inadequate access.

### **LIMITATIONS TO NOZZLE EXAMINATION**

Visual and Ultrasonic examination may have been limited by coatings, piping, insulation, ice, inadequate access, and existing staining.

### **LIMITATIONS TO FIXED ROOF EXAMINATION**

External Visual and Ultrasonic examination may have been limited by coatings, pooling water, insulation, ice, inadequate access, and inadequate fall protection.

---

## **12. NDE EQUIPMENT**

### **MAGNETIC FLUX EXCLUSION**

The MFE equipment utilized consisted of a MFE 2412 Mark II (2002 Model), serial number 0703020, calibration date June 14 / 2016.

### **ULTRASONIC**

The ultrasonic (UT) equipment utilized for the inspection was an Olympus Epoch-04 Flaw Detector, serial number 051388512, calibration date January 15 / 2016.

The transducers utilized were a Technisonic 0.250 inch, 5 MHz dual element and a Technisonic 0.375 inch, 5 MHz dual element.

On site calibration was performed in accordance with Ranger Inspection™ Procedure No. 2013-18 Revision No. 1: Ultrasonic Examination Procedure for Thickness Determination.

Water was used as a couplant.

### **PIT GAUGE**

The pit gauge utilized was a W.R. Thorpe Co. standard pipe pit gauge.

### **COATING THICKNESS GAUGE**

Positector® 6000 Series

---

## **13. WARRANTY**

Ranger Inspection™ has evaluated the condition of this tank based on the observations and measurements made by the Ranger Inspection™ Tank Inspectors. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner / operator must independently assess the inspection information / report provided by Ranger Inspection™ and any conclusions reached by the tank owner / operator and any action taken or omitted to be taken are the sole responsibility of the owner / operator. With respect to inspection and testing, Ranger Inspection™ warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Ranger Inspection™ shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Ranger Inspection™ be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Ranger Inspection™ be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of equipment tested or services by Ranger Inspection™ or any associated damage to facilities, down-time costs or claims of other damages.













9" PATCH  
FIELD

CE



