

**ATMOSPHERIC STORAGE TANK  
API 653 EXTERNAL & ULTRASONIC  
IN-SERVICE INSPECTION REPORT**



SHELL PIPELINE COMPANY, LP

TANK NO. 6

ST. JAMES TERMINAL

ST. JAMES, LA

JANUARY 11 – 12, 2016



Prepared by:

HMT Inspection  
A Division of HMT LLC  
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**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 2 of 59

## **EXECUTIVE SUMMARY**

It is recommended that the owner / user reviews, evaluates and implements the recommendations set forth in Section 2.0, Inspection Summary, of this report or, the owner / user may determine that no action(s) need be taken prior to continued service and such decision(s) should be documented in the AST historical record file.

It is recommended that the owner / user adheres to the safe fill height recommendations given herein in Section 2.0 for continued service until such time as tank operating conditions change or another inspection assessment per API 653 guidelines determines that an adjustment in safe operating height for this tank should be made.

- The next external API 653 inspection should be conducted within 5 years and no later than January 2021 (ref. API 653, Para. 6.3.2.1). Complete API 653 out-of-service inspection prior to this date would supplement the next external inspection requirement. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the RCA calculations.
- Ultrasonic (UT) testing of the shell should be conducted again within 15 years and no later than January 2031 (ref. API 653, Para. 6.3.3.2 b). NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the RCA calculations.
- The minimum required thickness calculations were performed using the owner / operator safe fill height of 33.250 ft.
- Shell thickness calculations indicate the safe fill height of 33.25 feet can be utilized with product specific gravities up to 1.0 (ref. API 653, Para. 4.3.3.1).. For products with a specific gravity over 1.0, additional calculations should be performed (ref. API 653, Para. 4.3.3.1). These calculations do not take into account operational restrictions from such items as high-level alarms or owner / operator-imposed safe fill restrictions. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the safe fill height calculations.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 3 of 59

## **PERSONNEL**

HMT Inspection provided the following personnel:

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Fausto Alejandro Maldonado  
API 653 Aboveground Storage Tank Inspector  
Certification Number: 25916  
Level II Technician

Luch Neang and Daniel Poarch  
Technicians

# TABLE OF CONTENTS

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1.0 DESCRIPTION.....	5
2.0 INSPECTION SUMMARY.....	6
3.0 INSPECTION REPORT .....	9
3.1 FOUNDATION .....	9
3.1.1 FOUNDATION SETTLEMENT EVALUATION .....	9
3.1.2 FOUNDATION SETTLEMENT SURVEY .....	10
3.2 SHELL.....	11
3.2.1 SHELL THICKNESS CALCULATIONS .....	11
3.2.2 SHELL CORROSION RATE CALCULATIONS.....	12
3.2.3 SHELL EXTERNAL INSPECTION .....	13
3.2.4 B-SCAN.....	14
4.0 INSPECTION REPORT .....	24
4.1 FOUNDATION .....	24
4.1.1 FOUNDATION INSPECTION CHECKLIST .....	24
4.2 BOTTOM.....	25
4.2.1 BOTTOM INSPECTION CHECKLIST .....	25
4.3 SHELL.....	26
4.3.1 SHELL INSPECTION CHECKLIST .....	26
4.3.2 SHELL LAYOUT 1 OF 2 .....	27
4.3.3 SHELL LAYOUT 2 OF 2 .....	28
4.3.4 SHELL UT TABLES .....	29
4.4 NOZZLES AND APPURTENANCES.....	30
4.4.1 NOZZLE AND APPURTENANCE INSPECTION CHECKLIST .....	30
4.4.2 NOZZLE AND APPURTENANCE TABLE .....	32
4.5 FLOATING ROOF.....	35
4.5.1 FLOATING ROOF INSPECTION CHECKLIST .....	35
4.5.2 FLOATING ROOF NOZZLE TABLE.....	38
4.5.3 FLOATING ROOF LAYOUT .....	39
5.0 NDT INSPECTION.....	40
5.1 NDT INSPECTION SCOPE .....	40
5.2 SHELL INSPECTION.....	40
5.3 NOZZLE INSPECTION.....	40
5.4 FLOATING ROOF INSPECTION.....	40
6.0 EQUIPMENT .....	41
6.1 ULTRASONIC .....	41
6.2 LEVEL .....	41
7.0 WARRANTY.....	42
8.0 PHOTOGRAPHS .....	43
9.0 CERTIFICATIONS .....	59

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 5 of 59

## 1.0 DESCRIPTION

### GENERAL:

TANK NUMBER / IDENTIFICATION:	6
OWNER:	Shell Pipeline Company, LP
TANK LOCATION:	St. James, LA
TYPE OF FACILITY:	Terminal
MANUFACTURER:	Graver Tank & Mfg. Co. Inc.
DESIGN STANDARD:	API 650, 6 <sup>th</sup> Edition w/ App. D and K
PRODUCT PRIOR TO INSPECTION:	Crude Oil
DESIGN SPECIFIC GRAVITY:	0.876
PRODUCT SPECIFIC GRAVITY:	0.87
DESIGN PRESSURE:	Atmospheric
OPERATING TEMPERATURE:	Ambient
CATHODIC PROTECTION & TYPE:	Yes (Impressed Current)
NAMEPLATE PRESENT:	Yes
DOT REGULATED TANK:	Yes
LATITUDE:	30° 00' 34" N
LONGITUDE:	90° 51' 10" W

### DIMENSIONS:

DIAMETER:	300.00 ft.
HEIGHT:	36.83 ft.
CAPACITY GROSS:	463,677 bbls.
OPERATING HEIGHT:	33.250 ft.
CAPACITY NOMINAL:	418,707 bbls.

### GEOMETRY:

FOUNDATION:	Concrete Ringwall
BOTTOM:	Lap Welded
SHELL:	Butt Welded
MATERIAL OF CONSTRUCTION:	Carbon Steel (Grade Not Known)
COURSE 1 AVERAGE THICKNESS:	1.123 inches
FLOATING ROOF:	Lap Welded Annular Pontoon w/ Deck Pontoons
PRIMARY SEAL:	No Data Available
SECONDARY SEAL:	Metallic Wiper

### DATES:

YEAR OF CONSTRUCTION:	1979
SECOND BOTTOM & DATE INSTALLED	N/A
LAST COATED:	No Data Available
LAST INSPECTION:	2010 (In-Service)

### ACCESS:

STAIRWAY:	Spiral (CCW Up)
FLOATING ROOF ACCESS:	Rolling Ladder

### COATINGS / LININGS:

BOTTOM & DATE APPLIED:	No Data Available
SHELL:	External – White Paint Internal – No Data Available
FLOATING ROOF:	Top Side – White Paint

**API 653 In-Service Inspection Report**  
for  
**Shell Pipeline Company, LP**  
**Tank No. 6**  
**St. James, LA**



January 11 – 12, 2016  
Page 6 of 59

## 2.0 INSPECTION SUMMARY

The following is a summary of the significant findings of the inspection (item numbers correspond with the HMT API 653 Checklist).

### INSPECTION INTERVALS:

The next external API 653 inspection should be conducted within 5 years and no later than January 2021 (ref. API 653, Para. 6.3.2.1). Complete API 653 out-of-service inspection prior to this date would supplement the next external inspection requirement. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the RCA calculations.

Ultrasonic (UT) testing of the shell should be conducted again within 15 years and no later than January 2031 (ref. API 653, Para. 6.3.3.2 b). NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the RCA calculations.

The minimum required thickness calculations were performed using the owner / operator safe fill height of 33.250 ft.

Shell thickness calculations indicate the safe fill height of 33.25 feet can be utilized with product specific gravities up to 1.0 (ref. API 653, Para. 4.3.3.1).. For products with a specific gravity over 1.0, additional calculations should be performed (ref. API 653, Para. 4.3.3.1). These calculations do not take into account operational restrictions from such items as high-level alarms or owner / operator-imposed safe fill restrictions. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the safe fill height calculations.

### FOUNDATION:

**ITEM F2:** The survey found the tank out of level by 7.08 inches. API 653 calculation for deflection of this tank is 0.59 inch. API maximum deflection permitted for this tank is calculated at 1.83 inches (ref. API 653, Appendix B, Para. B.3). Differential settlement for this tank does not exceed the API allowable (ref. API 653, Appendix B, Para. B.3). Future settlement should be monitored during the next API 653 external inspection.

**ITEM F7:** The concrete ringwall has minor surface stress cracks intermittently around the tank perimeter. This condition should be monitored and consideration should be given to possibly coating the ringwall to seal the cracks and minimize further deterioration.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 7 of 59

## **INSPECTION SUMMARY (CONT'D.)**

### **FOUNDATION (CONT'D.):**

**ITEMS F11:** The visible portion of the moisture barrier has deteriorated. The seal material underneath the bottom edge projection is still in serviceable condition. Consideration should be given to replacing the moisture barrier at the next out-of-service inspection.

### **BOTTOM:**

**ITEM B1:** Tank No. 6 was constructed to API 650 by Graver Tank & Mfg. Co. in 1979. The tank is in service and no inspection was conducted on the internal bottom. Visual (VT) inspection of the bottom edge projection found this detail in acceptable condition.

### **SHELL:**

**ITEMS S1 & S13:** Shell thickness calculations indicate the safe fill height of 33.25 feet can be utilized with product specific gravities up to 1.0 (ref. API 653, Para. 4.3.3.1).. For products with a specific gravity over 1.0, additional calculations should be performed (ref. API 653, Para. 4.3.3.1). These calculations do not take into account operational restrictions from such items as high-level alarms or owner / operator-imposed safe fill restrictions. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the safe fill height calculations.

**ITEM S6:** The entire shell coating was found in serviceable condition with no recordable areas of coating failure noted.

**ITEM S11:** There are two (2) wind girders installed on this tank at the top of Course 3 and on the upper section of Course 4. Visual (VT) inspection found both wind girders covered with surface mold and mildew. Consideration should be given to cleaning these items.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 8 of 59

## **INSPECTION SUMMARY (CONT'D.)**

### **NOZZLES AND APPURTENANCES:**

**ITEM N2:** Manways I, Q, and Y have weld spacing between their reinforcing plate welds and the shell-to-bottom weld that is less than that required by API 650, Para. 5.7.3. Such practice results in areas of increased stress concentration and possible accelerated corrosion. Visual (VT) inspection of these manways / nozzle details did not identify any such corrosion at this time. Consideration should be given to modifying these penetration details in accordance with API 650 guidelines the next time this tank has major repairs to the shell or when hydrostatic testing is required for other reasons. These areas should be monitored in future for signs of accelerated corrosion due to possible increased stress concentrations.

**ITEM N8:** Inspection of the temperature indicator noticed that the sight glass is broken. The indicator is not in use. Consideration should be given to replacing this detail.

**ITEM N9:** The automatic gauge level is not showing the actual level product due to missing parts. Consideration should be given to repairing and calibrating this device.

### **FLOATING ROOF:**

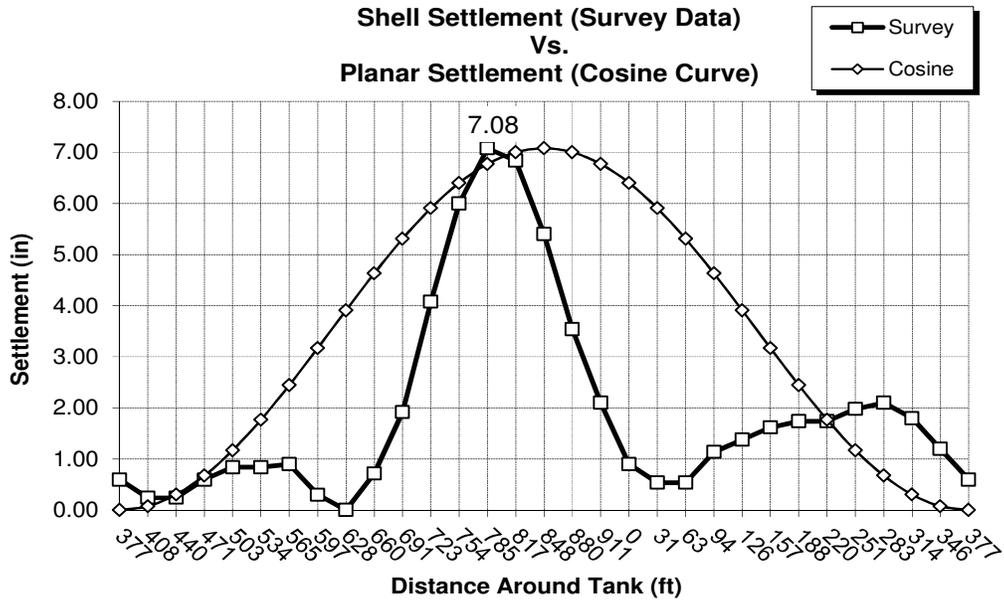
**ITEM FLR28:** The tank was in service. Visual (VT) inspection of the external floating roof was performed from the platform only due to safety concerns. The floating roof coating is in poor condition. No evidence of product or any other evident defects were noted on the floating roof deck.

**ITEM FLR37:** Visual (VT) inspection of the floating roof revealed low areas that are retaining water and debris. This condition was observed on the roof deck plates and pontoon deck plates. Due to the tank diameter and the presence of deck pontoons, Visual (VT) inspection was very limited.

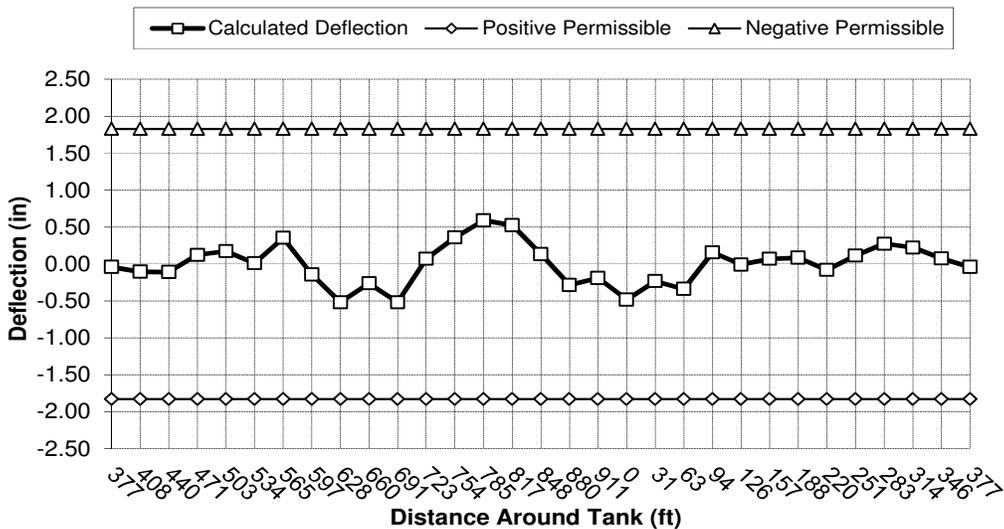
### 3.0 INSPECTION REPORT

#### 3.1 FOUNDATION

##### 3.1.1 FOUNDATION SETTLEMENT EVALUATION



##### Differential Settlement Evaluation



**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 10 of 59

### 3.1.2 FOUNDATION SETTLEMENT SURVEY

The survey was conducted externally counterclockwise from the reference Shell Manway A located at Station 0.0. The circumferential distance between the readings is 31.416 feet.

Point No.	Shell Settlement Reading (ft.)
1	5.230
2	5.200
3	5.200
4	5.250
5	5.270
6	5.290
7	5.300
8	5.300
9	5.320
10	5.330
11	5.305
12	5.255
13	5.205
14	5.175
15	5.175
16	5.205
17	5.225
18	5.225
19	5.230
20	5.180
21	5.155
22	5.215
23	5.315
24	5.495
25	5.655
26	5.745
27	5.725
28	5.605
29	5.450
30	5.330

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 11 of 59

## 3.2 SHELL

### 3.2.1 SHELL THICKNESS CALCULATIONS

The minimum acceptable shell plate thickness for tanks with a diameter greater than two hundred (200) feet are calculated utilizing the variable design point method (ref. API 653, Para. 4.3.3.4):

$$t_{\min} = \frac{2.6(H - 1)DG}{SE}$$

**Where:**

**S** = See Table = Allowable Stress (psi)  
**D** = 300.00 = Nominal Diameter of Tank (ft.)  
**G** = 1.0 = Highest Specific Gravity of Contents  
**H** = See Table = Product Height (ft.)  
**E** = See Table = Joint Efficiency

Course	Course Height (in.)	Product Height (ft.)	Joint Efficiency	Allowable Stress (psi)	Average Thickness (in.)	Required Thickness (in.)	Material Type / Grade
1	110.0	33.25	1.00	23,600	1.123	0.993	Carbon Steel
2	110.0	24.08	1.00	23,600	0.819	0.693	Carbon Steel
3	109.5	14.92	1.00	26,000	0.540	0.375	Carbon Steel
4	112.5	5.79	1.00	26,000	0.382	0.127	Carbon Steel

\*Material Grade Not Known

Shell thickness calculations indicate the safe fill height of 33.25 feet can be utilized with product specific gravities up to 1.0 (ref. API 653, Para. 4.3.3.1).. For products with a specific gravity over 1.0, additional calculations should be performed (ref. API 653, Para. 4.3.3.1). These calculations do not take into account operational restrictions from such items as high-level alarms or owner / operator-imposed safe fill restrictions. NOTE: The stairway Ultrasonic (UT) thickness measurements for Course 4 were used for the safe fill height calculations.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 12 of 59

### 3.2.2 SHELL CORROSION RATE CALCULATIONS

When the corrosion rate is not known, the maximum interval shall be 5 years (API 653, Para. 6.3.3.2 a). When the corrosion rate is known, the maximum interval shall be the smaller of  $RCA / 2N$  years or fifteen (15) years (API 653, Para. 6.3.3.2 b):

$$RCA = t_{act} - t_{min}$$

$$N = t_{prev} - t_{act} / Y$$

$$I_{UT} = t_{act} - t_{min} / 2N$$

**Where:**

- RCA**= See Table = Difference between the measured shell thickness and the minimum required thickness in inches.
- N**= See Table = Shell corrosion rate in inches per year
- Y**= Years in service = 6
- I<sub>UT</sub>**= See Table = Inspection interval for the next Ultrasonic (UT) testing, in years (not exceeding 15 years)

Course No.	Previous Thickness (in.) ( $t_{prev}$ )*	Current Measured Average Thickness (in.) ( $t_{act}$ )	Material Loss (in.)	Minimum Acceptable Course Thickness (in.) ( $t_{min}$ )	RCA (in.)	Corrosion Rate (in. / yr.) (N)	Next Ultrasonic (UT) Thickness Inspection (years) ( $I_{ut}$ )
1	1.076	1.123	0.000	0.993	0.130	0.0000	<b>15.00</b>
2	0.787	0.819	0.000	0.693	0.126	0.0000	<b>15.00</b>
3	0.479	0.540	0.000	0.375	0.165	0.0000	<b>15.00</b>
4	0.391	0.382	0.009	0.127	0.255	0.0015	<b>15.00</b>

\* = Previous thickness data from 2010 provided by client to facilitate corrosion rate calculations. It should be noted that without established Condition Monitoring Location (CML) points, data collection locations may vary between inspections.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 13 of 59

**3.2.3 SHELL EXTERNAL INSPECTION**

The external inspection interval shall be the lesser of 5 years or  $RCA / 4N$  (API 653, Para. 6.3.2.1):

$$RCA = t_{act} - t_{min}$$

$$N = t_{prev} - t_{act} / Y$$

$$I_{VT} = t_{act} - t_{min} / 4N$$

**Where:**

- RCA**= See Table = Difference between the measured shell thickness and the minimum required thickness in inches.
- N**= See Table = Shell corrosion rate in inches per year
- Y**= Years in service = 6
- I<sub>vt</sub>**= See Table = Inspection interval for the next External Visual Inspection, in years (not exceeding 5 years)

Course No.	Previous Thickness (in.) ( $t_{prev}$ )*	Current Measured Average Thickness (in.) ( $t_{act}$ )	Material Loss (in.)	Minimum Acceptable Course Thickness (in.) ( $t_{min}$ )	RCA (in.)	Corrosion Rate (in. / yr.) (N)	Next External Visual Inspection (years) ( $I_{vt}$ )
1	1.076	1.123	0.000	0.993	0.130	0.0000	<b>5.00</b>
2	0.787	0.819	0.000	0.693	0.126	0.0000	<b>5.00</b>
3	0.479	0.540	0.000	0.375	0.165	0.0000	<b>5.00</b>
4	0.391	0.382	0.009	0.127	0.255	0.0015	<b>5.00</b>

\* = Previous thickness data from 2010 provided by client to facilitate corrosion rate calculations. It should be noted that without established Condition Monitoring Location (CML) points, data collection locations may vary between inspections.

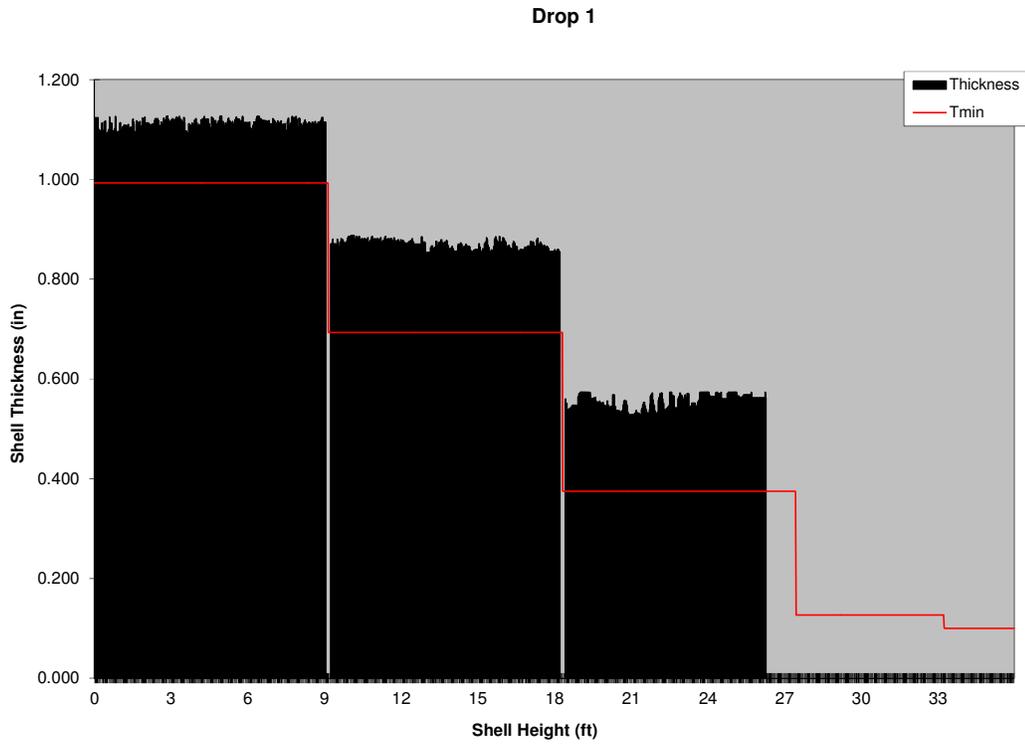
**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 14 of 59

**3.2.4 B-SCAN**

**DROP 1**



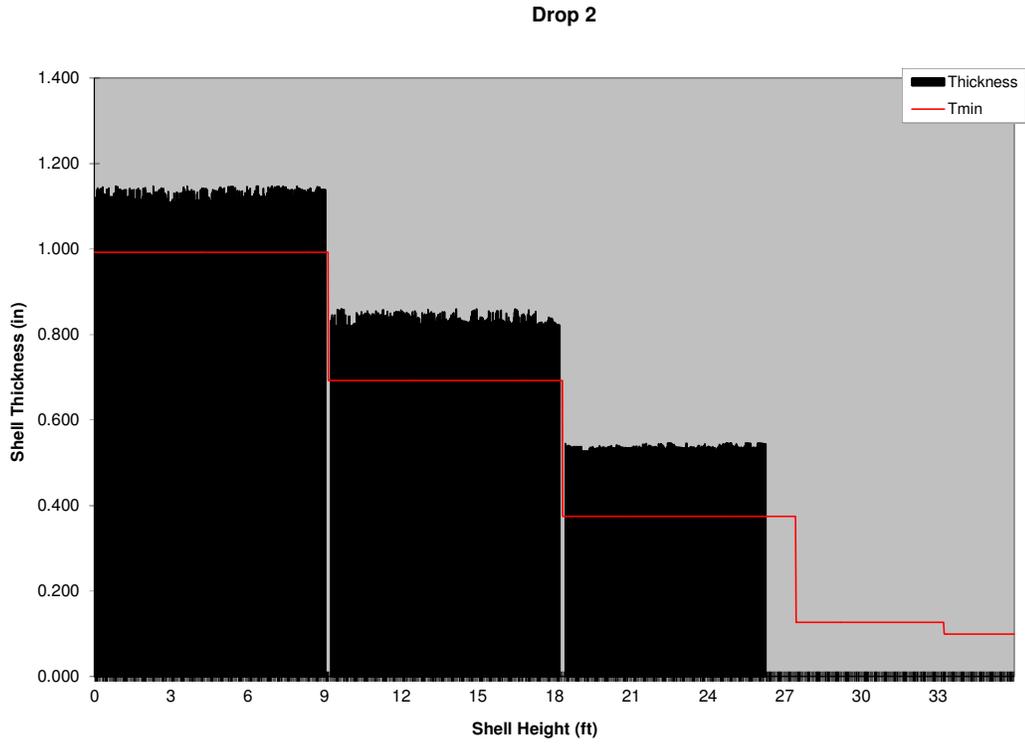
Drop 1	Min	Avg	Max
Course 1	1.087	1.109	1.127
Course 2	0.853	0.869	0.887
Course 3	0.528	0.555	0.573
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 15 of 59

**DROP 2**



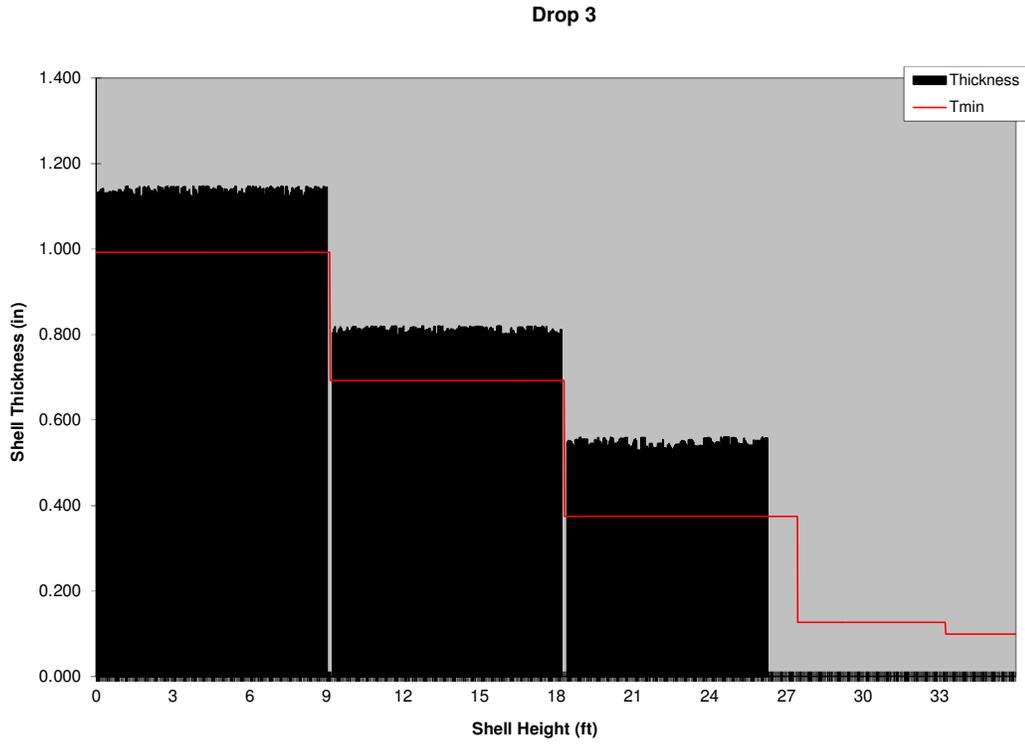
<b>Drop 2</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.108	1.130	1.147
Course 2	0.813	0.838	0.860
Course 3	0.527	0.537	0.547
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 16 of 59

**DROP 3**



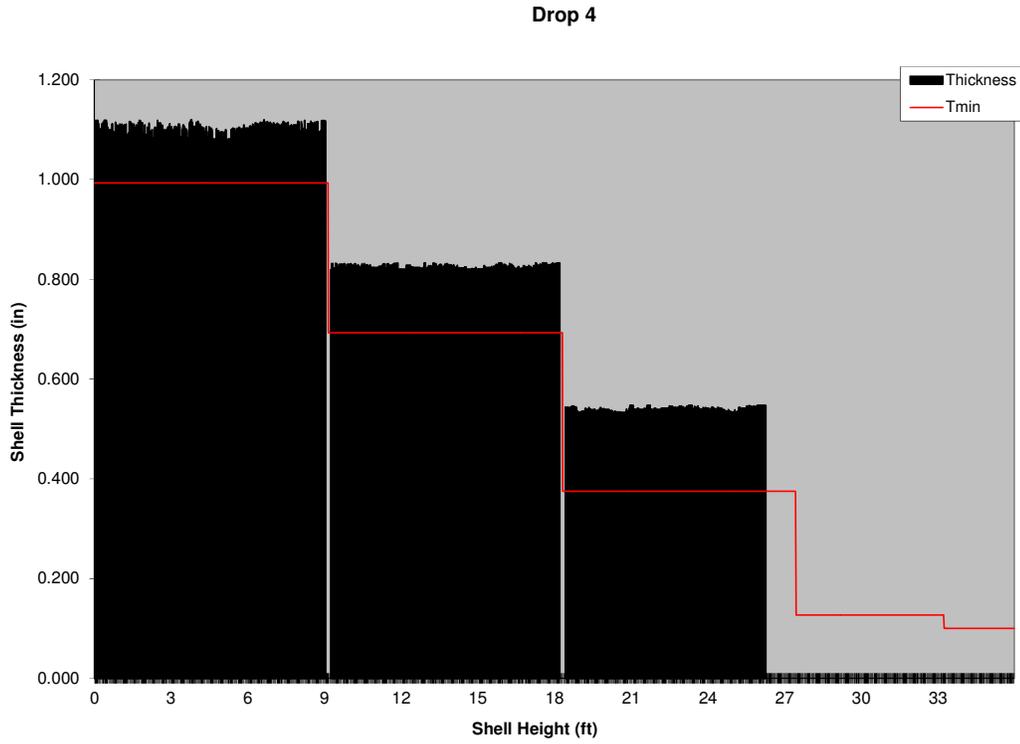
<b>Drop 3</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.121	1.137	1.147
Course 2	0.800	0.812	0.820
Course 3	0.527	0.547	0.560
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 17 of 59

**DROP 4**



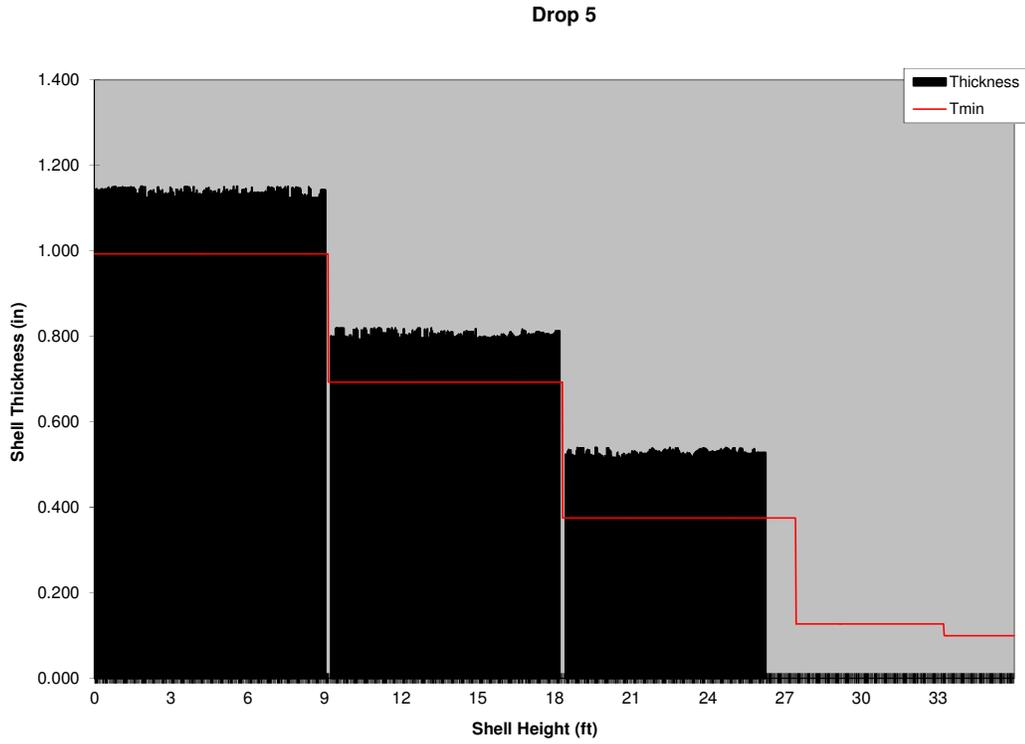
Drop 4	Min	Avg	Max
Course 1	1.080	1.101	1.120
Course 2	0.820	0.826	0.833
Course 3	0.533	0.540	0.547
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 18 of 59

**DROP 5**



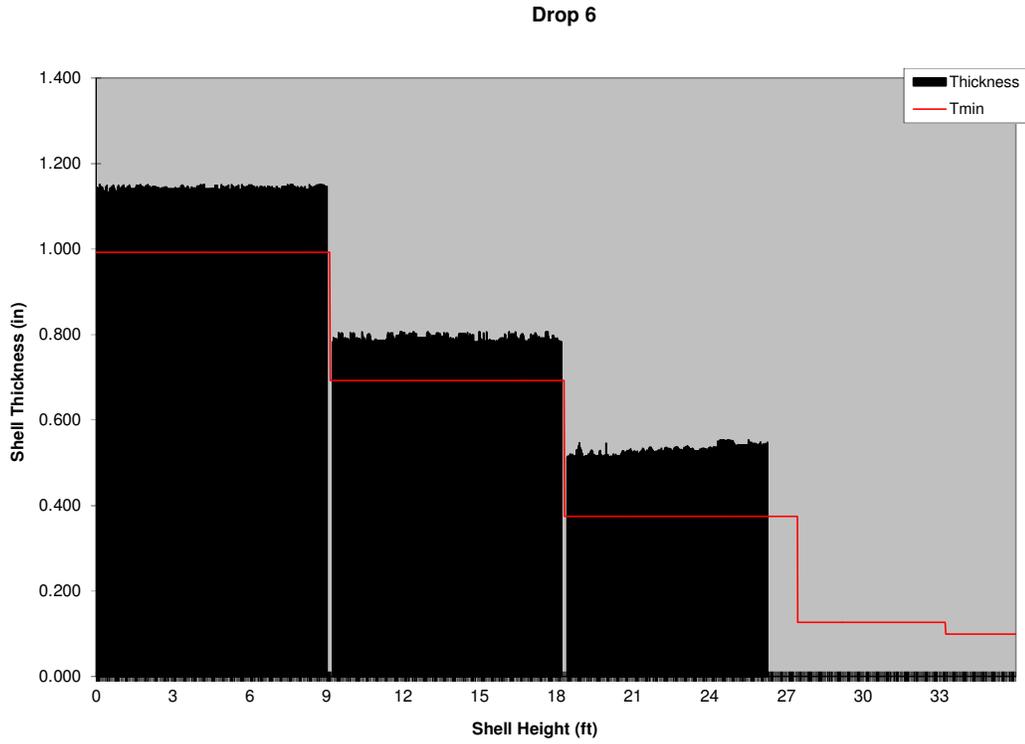
<b>Drop 5</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.113	1.138	1.151
Course 2	0.793	0.805	0.820
Course 3	0.516	0.529	0.540
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 19 of 59

**DROP 6**



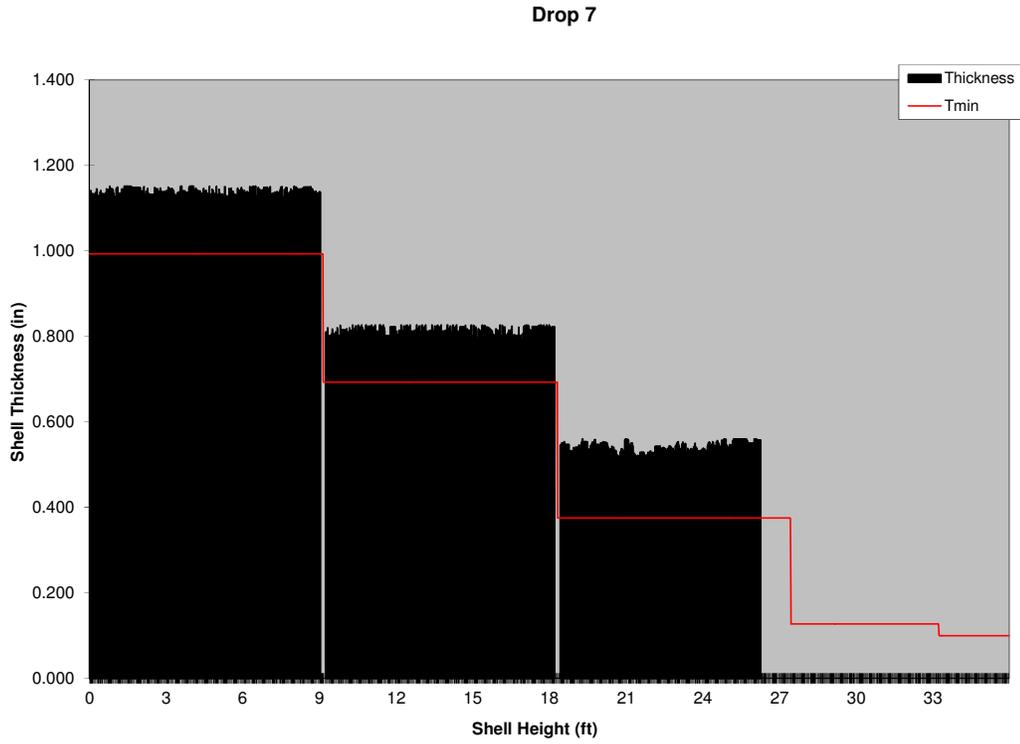
Drop 6	Min	Avg	Max
Course 1	1.127	1.144	1.151
Course 2	0.780	0.793	0.807
Course 3	0.513	0.531	0.553
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 20 of 59

**DROP 7**



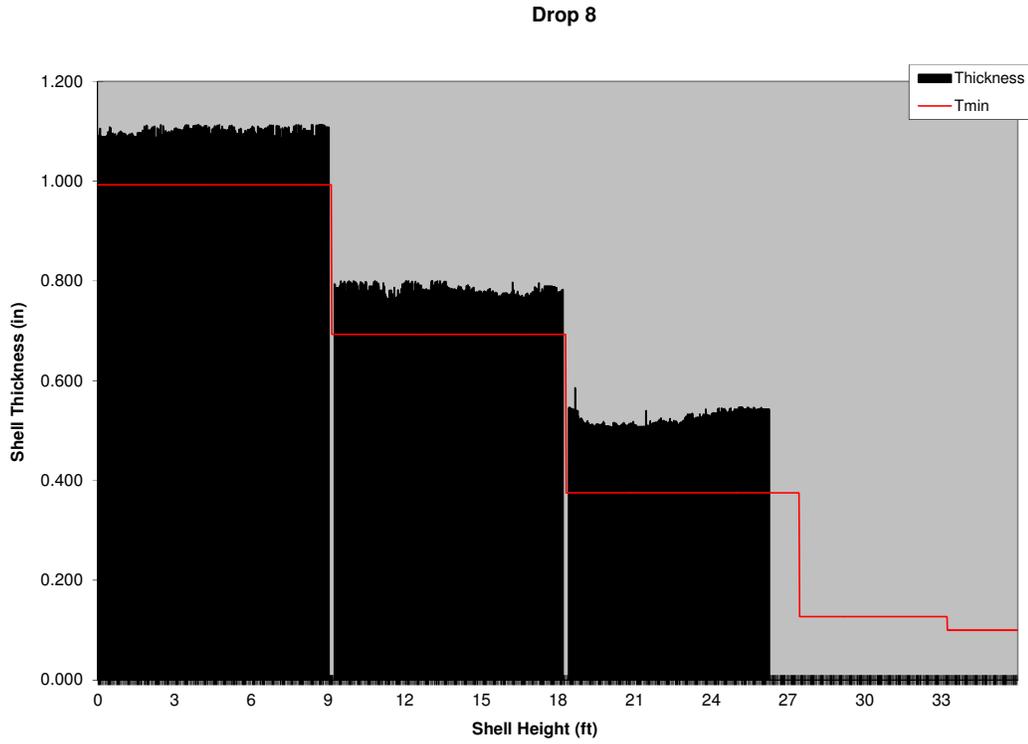
<b>Drop 7</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.127	1.140	1.151
Course 2	0.781	0.813	0.827
Course 3	0.516	0.542	0.560
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 21 of 59

**DROP 8**



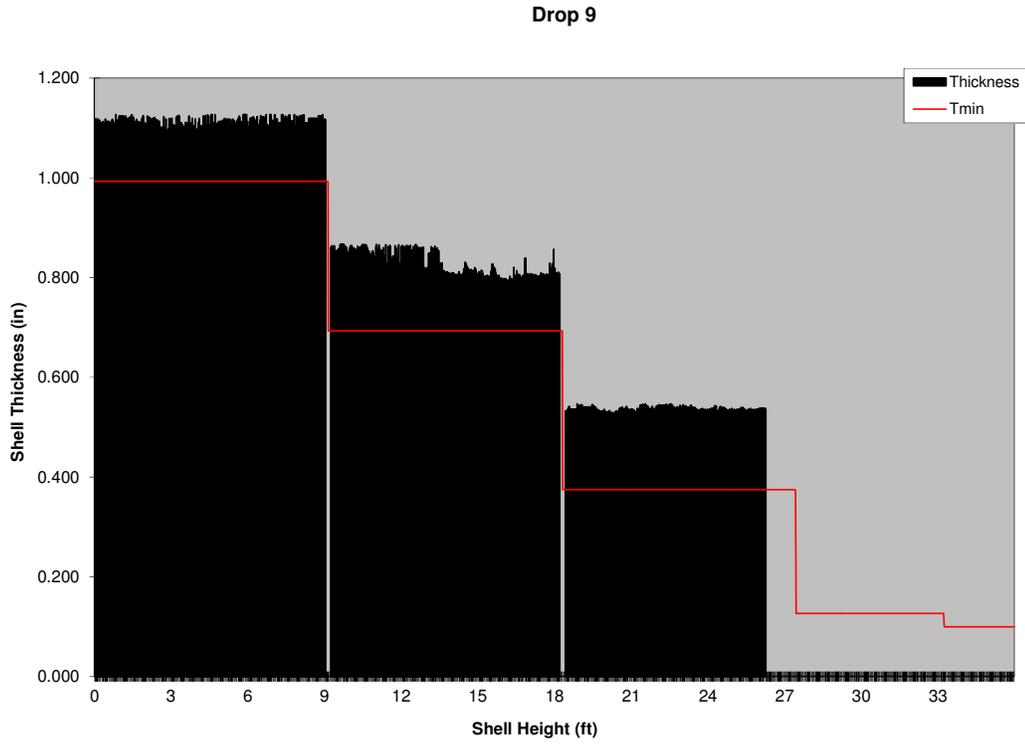
<b>Drop 8</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.087	1.100	1.113
Course 2	0.763	0.782	0.800
Course 3	0.507	0.525	0.586
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 22 of 59

**DROP 9**



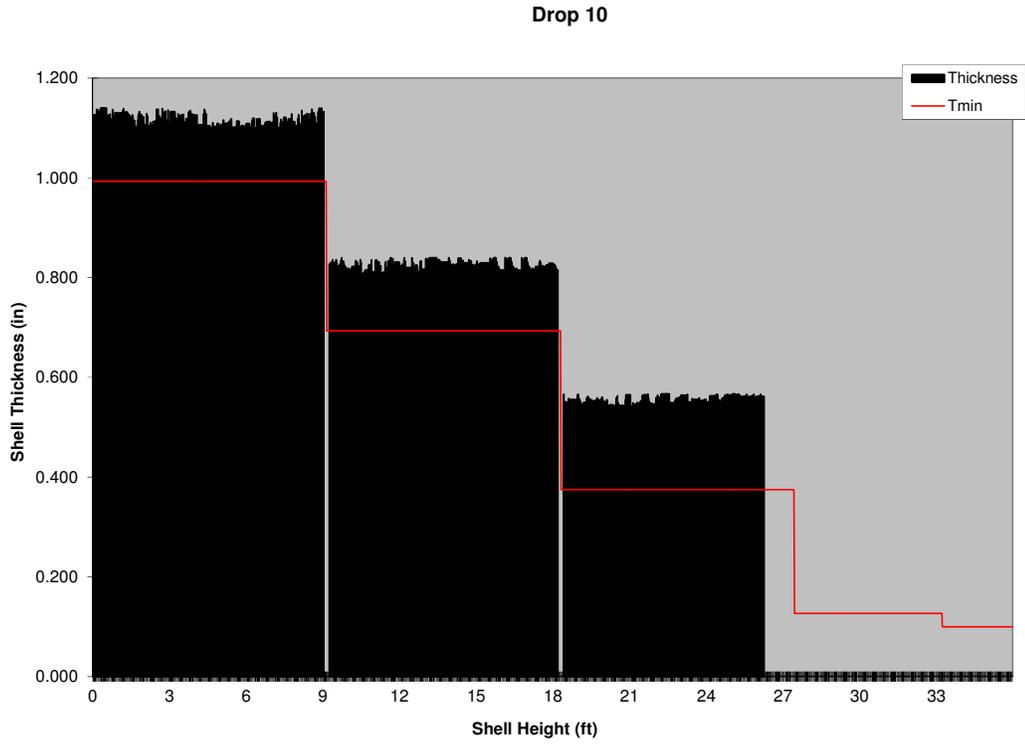
<b>Drop 9</b>	<b>Min</b>	<b>Avg</b>	<b>Max</b>
Course 1	1.093	1.113	1.127
Course 2	0.793	0.828	0.867
Course 3	0.527	0.537	0.547
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 23 of 59

**DROP 10**



Drop 10	Min	Avg	Max
Course 1	1.100	1.116	1.140
Course 2	0.807	0.826	0.840
Course 3	0.537	0.556	0.567
Course 4	--	--	--

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 24 of 59

## 4.0 INSPECTION REPORT

### 4.1 FOUNDATION

#### 4.1.1 FOUNDATION INSPECTION CHECKLIST

ITEM NO.	FOUNDATION	INSPECTION COMMENTS
F1	Condition of foundation support (ref. API 653, Para. 4.5.1).	Acceptable
F2	Perform bottom settlement survey (ref. API 653, Para. B.2.1).	Reference Sections 2.0 and 3.1.2
F3	Identify and measure dimensions of all areas of tank bottom bulges, depressions & settlement (ref. API 653, Paras. B.2.5 & B.3.3).	N/A
F4	Identify and measure all areas of internal bottom edge settlement (ref. API 653, Paras. B.2.3 & B.3.4 Figs. B.11 / B.12).	N/A
F5	Concrete ringwall free of debris (ref. API 653, Para. 6.3.1).	Acceptable
F6	Concrete ringwall beveled away from tank.	Acceptable
F7	Concrete ringwall free of cracks, breaks, spalling, exposed rebar, etc. (ref. API 653, Para. 4.5.1).	Reference Section 2.0
F8	Earth eroded due to water running off the tank (ref. API 653, Paras. 6.3.1, 4.4.2).	Acceptable
F9	Check for proper drainage and water runoff away from the tank (ref. API 653, Para. C.1.1.5).	Acceptable
F10	Check around the tank and within the dike for build-up of trash and vegetation (ref. API 653, Para. C.1.1.6).	Acceptable
F11	Moisture barrier condition at bottom edge projection to concrete ringwall (ref. API 653, Para. 6.3.1).	Reference Section 2.0
F12	Indications of bottom leakage (ref. API 653, Para. 6.3.1).	Acceptable
F13	Cavities or holes around / under tank perimeter (ref. API 653, Paras. 6.3.1 & C.1.1.1).	N/A
F14	Check for anchorage. Record sizes, spacing between anchors and condition (ref. API 653, Paras. 4.5.3 & 8.8).	N/A
F15	List any limitations to the foundation inspection.	Acceptable

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 25 of 59

## 4.2 BOTTOM

### 4.2.1 BOTTOM INSPECTION CHECKLIST

ITEM NO.	BOTTOM	INSPECTION COMMENTS
B1	Bottom edge projection condition (corroded or pitted, thinning, deformed, obstructed) (ref. API 653, Paras. 4.4.5.7 & 6.3.1.3).	Reference Section 2.0
B2	Record minimum bottom plate thickness requirements (ref. API 653, Para. 4.4.5).	N/A
B3	MFL scan of accessible bottom plates. Quantify all findings (ref. API 653, Paras. 4.4.4 & 4.4.5)	N/A
B4	Visual inspection of bottom plate surface condition (ref. API 653, Para. 4.4.1)	N/A
B5	Conduct Ultrasonic thickness readings of bottom plates. Record all data (ref. API 653, Para. 4.4.4).	N/A
B6	Locate unacceptable voids beneath bottom. Record the locations (ref. API 653, Para. 4.4.2.h & j & API 653, Para. 9.10.2.1.3).	N/A
B7	Visual inspection of bottom plate lap welds (for reportable indications or other anomalies) (ref. API 653, Para. 4.4.2, / Fig. 9.1).	N/A
B8	Perform Vacuum Box testing of bottom lap welds.	N/A
B9	Internal Shell-to-bottom weld condition (ref. API 653, Para. 4.4.2).	N/A
B10	Perform Magnetic Particle testing of internal shell-to-bottom weld.	N/A
B11	Perform Vacuum Box testing of internal shell-to-bottom weld.	N/A
B12	Identify all signs of product leakage.	N/A
B13	Floating roof leg striker plate condition (pitting, cutting, and dimpling).	N/A
B14	Fixed roof column bearing / base plate condition (corrosion, weld failure).	N/A
B15	Fixed roof column lateral clips (align tank columns) (ref. API 650, Para. 5.10.4.7)	N/A
B16	Conduct Visual inspection of reinforcing, bearing, base, striker plates and existing lap patches (ref. API 653, Paras. 9.10.1.2, & 9.10.3 & Fig. 9.9)	N/A
B17	List any limitations to bottom inspection.	N/A

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**

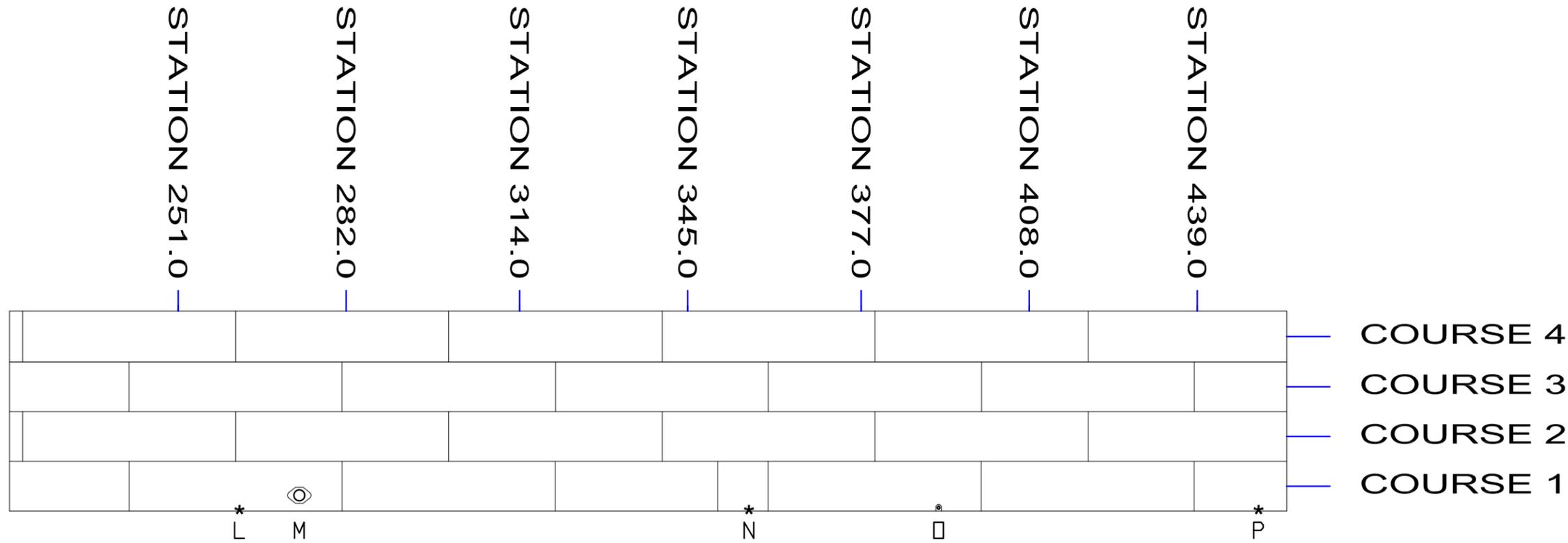
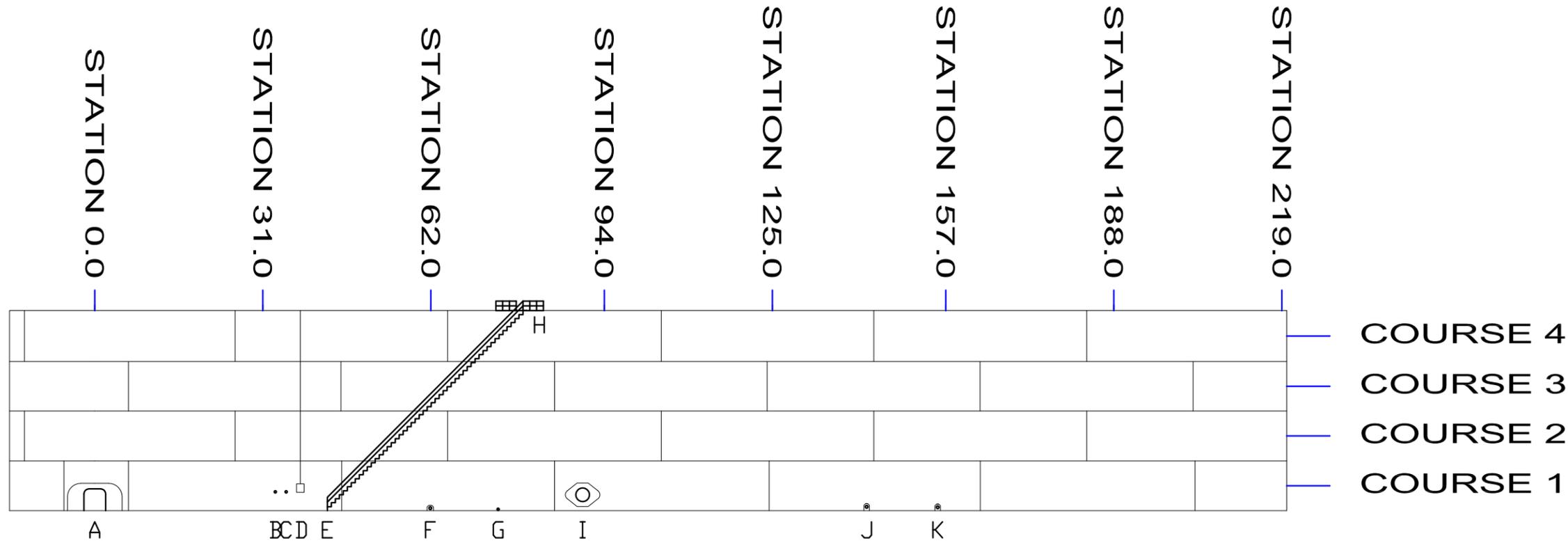


January 11 – 12, 2016  
Page 26 of 59

## 4.3 SHELL

### 4.3.1 SHELL INSPECTION CHECKLIST

ITEM NO.	EXTERNAL SHELL	INSPECTION COMMENTS
S1	Shell weld / seam condition. Perform shell thickness calculations (ref. API 653, Paras. 4.3.3.1, 4.3.4, 4.3.8 & 4.3.10).	Reference Section 2.0 Butt Welded
S2	Record number and pattern of rivets or bolts (ref. API 653, Table 4.3).	N/A
S3	Check exterior shell-to-bottom weld condition (ref. API 653, Para. 6.3).	Acceptable
S4	Identify all signs of product leakage (exterior) (ref. API 653, Para. 6.3).	Acceptable
S5	Perform Magnetic Particle testing of exterior shell-to-bottom weld (ref. API 653, Para. 4.3.6).	N/A
S6	Coating condition (Coating failure such as blistering, thinning, cracks, or discolored) (ref. API 653, Para. 6.3).	Reference Section 2.0
S7	Shell condition (deformations, corrosion, pitting) (ref. API 653, Para. 4.3).	Acceptable
S8	Rivet condition (worn, corroded, loose rivet sealer, leaking).	N/A
S9	Perform UT thickness readings on shell per job scope.	Acceptable
S10	Inspect support welds to shell for corrosion or defects.	Acceptable
S11	Wind girder / shell stiffeners condition (corrosion, weld failure). (ref. API 653, Para. 4.3.7)	Reference Section 2.0
S12	Note whether supports have reinforcing pads welded to shell.	N/A
S13	Shell-mounted vents / overflow slots present. Check for debris covering & condition of screens (ref. API 650, App. H, Para. H.5.3.3).	Reference Section 2.0
S14	Conduct Visual inspection of shell insulation. Inspect for damage (ref. API 653, Para. 6.3.2.2)	N/A
ITEM NO.	INTERNAL SHELL	INSPECTION COMMENTS
S15	Visual inspection of the internal shell surface for corrosion and pitting (ref. API 653, Para. 4.3).	N/A
S16	Visual inspection of interior shell welds / seams (ref. API 653, Para. 4.3.8).	N/A
S17	Visual inspection of rivets (Check for corrosion pitting, or looseness and riveted seams leaks).	N/A
S18	Inspect support welds to shell for corrosion or defects.	N/A
S19	Note whether supports have reinforcing pads welded to shell.	N/A
S20	List any limitations to shell inspection.	Acceptable



DRAWING NOT TO SCALE

**GENERAL**

1. DESIGN STANDARD : API 650, 6TH ED., w/APPS D & K
2. MANUFACTURER : GRAVER TANK & MFG. CO.
3. PRODUCT : CRUDE OIL
4. NAMEPLATE : YES
5. DIAMETER : 300.00'
6. HEIGHT : 36.83'
7. JOINT EFFICIENCY:

COURSE	
1	1.0
2	1.0
3	1.0
4	1.0

8. BUTT WELDED
9. COURSES : 4
10. CONSTRUCTED : 1979
11. STAIRWAY : SPIRAL (CCW UP)
12. COATING : EXTERNAL WHITE PAINT

COURSE	AVERAGE THICKNESS (INCH)	HEIGHT (INCH)
1	1.123	110.00
2	0.819	110.00
3	0.540	109.50
4	0.382	112.50

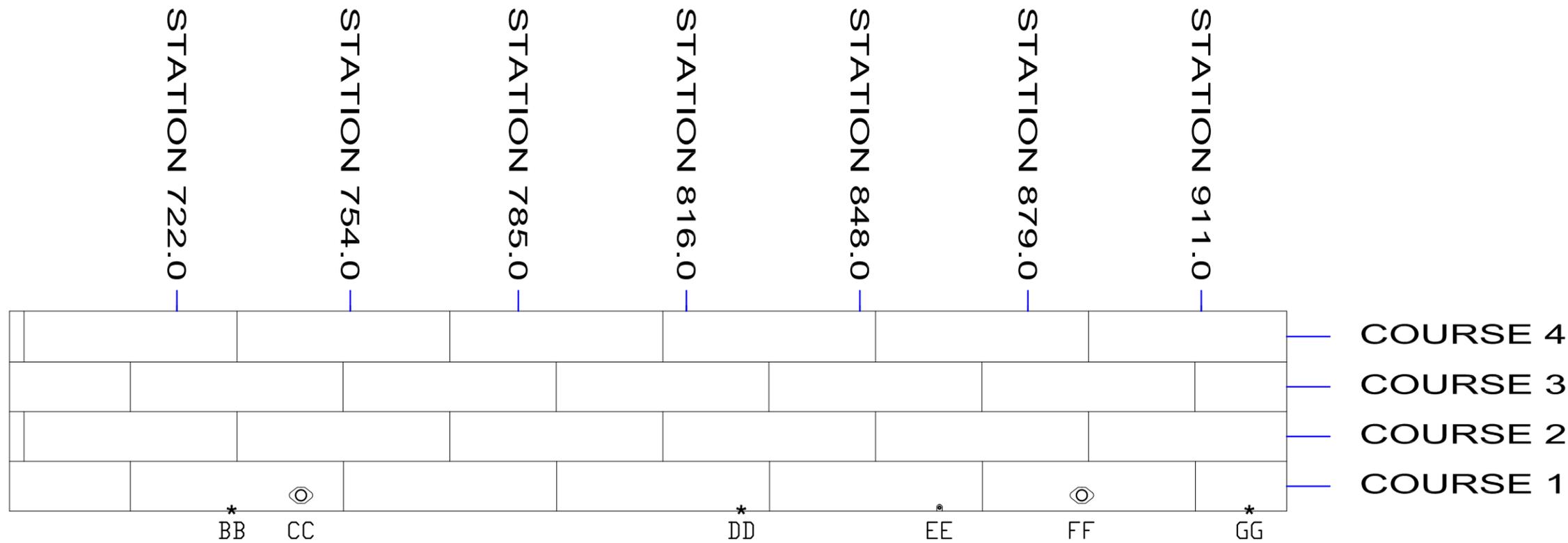
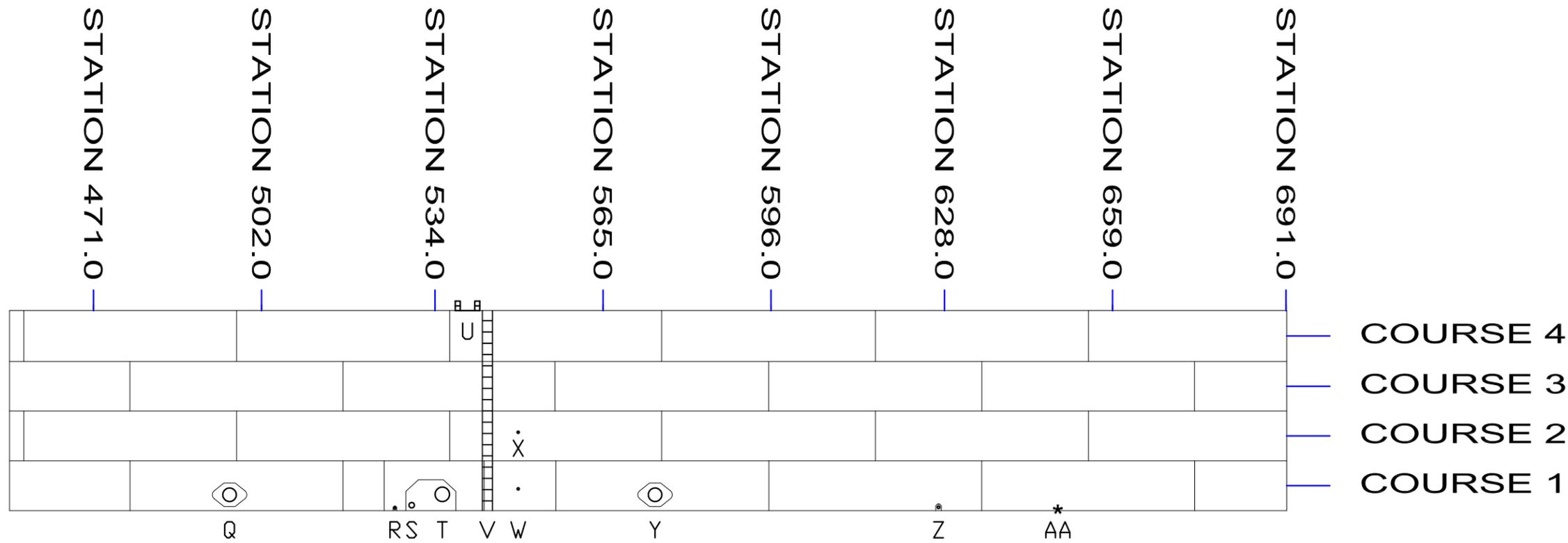
**LEGEND**

REFERENCE NOZZLE AND APPURTENANCE TABLE FOR ITEM IDENTIFICATION



**HMT INSPECTION**  
8979 MARKET STREET RD  
HOUSTON, TX 77029-3421

TITLE: <b>SHELL LAYOUT</b>	
OWNER: SHELL PIPELINE COMPANY, LP.	
TANK NO: <b>6</b>	JOB NO: <b>224-42016</b>
DRAWN BY: <b>J.NAUGLE</b>	DATE: <b>12 JAN 2016</b>



DRAWING NOT TO SCALE

**GENERAL**

1. DESIGN STANDARD : API 650, 6TH ED., w/APPS D & K
2. MANUFACTURER : GRAVER TANK & MFG. CO.
3. PRODUCT : CRUDE OIL
4. NAMEPLATE : YES
5. DIAMETER : 300.00'
6. HEIGHT : 36.83'
7. JOINT EFFICIENCY:

COURSE	
1	1.0
2	1.0
3	1.0
4	1.0

8. BUTT WELDED
9. COURSES : 4
10. CONSTRUCTED : 1979
11. STAIRWAY : SPIRAL (CCW UP)
12. COATING : EXTERNAL WHITE PAINT

COURSE	AVERAGE THICKNESS (INCH)	HEIGHT (INCH)
1	1.123	110.00
2	0.819	110.00
3	0.540	109.50
4	0.382	112.50

**LEGEND**

REFERENCE NOZZLE AND APPURTENANCE TABLE FOR ITEM IDENTIFICATION



**HMT INSPECTION**  
8979 MARKET STREET RD  
HOUSTON, TX 77029-3421

TITLE: <b>SHELL LAYOUT</b>	
OWNER: SHELL PIPELINE COMPANY, LP.	
TANK NO: 6	JOB NO: 224-42016
DRAWN BY: J.NAUGLE	DATE: 12 JAN 2016

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 29 of 59

**4.3.4 SHELL UT TABLES**

**SHELL READINGS  
(in inches)**

READING NO./ID	COURSE 1	COURSE 2	COURSE 3	COURSE 4
1	1.105	0.784	0.463	0.376
2	1.109	0.792	0.467	0.379
3	1.097	0.797	0.471	0.380
4	1.099	0.788	0.472	0.381
5	1.091	0.783	0.475	0.381
6	1.080	0.785	0.475	0.383
7	1.080	0.785	0.475	0.386
8	1.082	0.789	0.475	0.385
9	1.068	0.792	0.473	0.384
10	1.051	0.795	0.473	0.383
<b>Average:</b>	<b>1.086</b>	<b>0.789</b>	<b>0.472</b>	<b>0.382</b>
Minimum:	1.051	0.783	0.463	0.376
Maximum:	1.109	0.797	0.475	0.386

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 30 of 59

## 4.4 NOZZLES AND APPURTENANCES

### 4.4.1 NOZZLE AND APPURTENANCE INSPECTION CHECKLIST

ITEM NO.	EXTERNAL NOZZLES AND APPURTENANCES	INSPECTION COMMENTS
N1	Document nozzle / manway information on the Nozzle and Appurtenance Table (ref. API 653, Para. 4.3.9).	Reference Table 4.4.2
N2	Evaluate nozzle(s) / manway(s) acceptability to current API 650 / 653 guidelines. Weld spacing, centerline, reinforcement size, nozzle neck thickness (inspect shell nozzles for thinning, pitting and coating failure) and telltale holes, etc. (ref. API 650, Paras. 5.7, 5.7.5.1 and 5.7.2.10 & API 650, Table 5.6B & Fig. 5.8)	Reference Section 2.0 and Table 4.4.2
N3	Visual inspection of all external welds (ref. API 653, Para. 4.3.9.1).	Acceptable
N4	Indications of leakage around manways, nozzles, flanges and appurtenances (including reinforcement, bolting, gaskets and seals).	Acceptable
N5	Check piping and valves for leaks, thermal relief, or signs of damage (ref. API 653, Para. C.1.3.2).	Acceptable
N6	Inspect mixer for support, leakage and defects (ref. API 653, Para. C.1.3.6).	Acceptable
N7	Roof drain leakage.	Acceptable
N8	Temperature indicators / probes (corrosion, mechanical damage).	Reference Section 2.0
N9	Automatic gauge condition (corrosion, mechanical damage) (ref. API 653, Para. C.1.3.3) & (ref. API 653, Para. 6.9.3b).	Reference Section 2.0  Type: Tape & Float  Mfg.: Gauging Systems  Model: 5464B
N10	Check welds on shell-mounted davit clips above large valves or equipment (ref. API 650, Para. 5.8.3.5) & (ref. API 653, Para. C.1.3.2h).	Acceptable
N11	Welds on stairways / ladders, gauge platform / ladder, landing platform stringers (corrosion, broken, coating failure) (ref. API 650, Para. 5.8.1.2.a & API 653, Para. C.2.12.4).	Acceptable
N12	Verify requirements for Platforms, Walkways & Stairways (ref. API 650, Table 5.17 & Table 5.18). <b>Note: retrofit of existing tanks is not required.</b>	Acceptable

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 31 of 59

<b>NOZZLE AND APPURTENANCES (CONT'D.)</b>		
<b>ITEM NO.</b>	<b>INTERNAL NOZZLES AND APPURTENANCES</b>	<b>INSPECTION COMMENTS</b>
N13	Shell nozzle and internal piping condition.	N/A
N14	Hot tap nozzles (sealed internally) (ref. API 653, Para. 9.14 & Table 9.1) (ref. API 653, Para. 12.1.2.1b).	N/A
N15	Check for possible causes of damage to the seal (i.e. nozzle interference).	N/A
N16	Visual inspection of all accessible welds (ref. API 653, Para. 4.3.9.1) (weld defects and location).	N/A
N17	Check automatic gauge condition.	N/A
<b>INTERNAL APPURTENANCES / FLOATING SUCTION LINE</b>		
N18	Visual inspection of internal piping and connection condition (corrosion, cracking).	N/A
N19	Visual inspection of piping supports and pads (structurally adequate, weld failure).	N/A
N20	Determine condition / length of swing line / limit chain (ref. API 653, Para. C. 2.11.6).	N/A
<b>INTERNAL APPURTENANCES / FLOATING ROOF DRAIN</b>		
N21	Type and condition (cutting or dragging on tank bottom) (ref. API 650, Para. 4.2.3.3) (ref. API 653, C. 2.10).	N/A
N22	Internal piping and connection condition (corrosion, cracking).	N/A
N23	Check for obstructions that pipe could catch on (ref. API 650, Para. 5.8).	N/A
N24	Swing line hold-down cable (damaged or loose).	N/A
N25	Swing line safety hold-down chains (corrosion, weak links).	N/A
N26	List any limitations to nozzle & appurtenance inspection.	N/A

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 32 of 59

**4.4.2 NOZZLE AND APPURTENANCE TABLE**

Item	Description	Pipe Size (in.)	Station (ft.)	CL Elev. (in.)	Reinforcing Plate					1 or 2 Piece	Neck Thick (in.)	Flange Thick (in.)	Cover Thick (in.)	Tell-tale	Weld Space (in.)	Comments
					Width (in.)	Height (in.)	Thick (in.)	Shape								
A	Cleanout	48x48	0.00	24	124	72	1.254	D	1	1.226	1.001	0.919	Y	F		
B	Nozzle	2	33.30	41.50	-	-	-	-	-	0.209	0.766	0.751	-	40	w/ Temperature gauge	
C	Nozzle	1.75	35.30	41.50	-	-	-	-	-	0.181	0.692	0.690	-	40		
D	Automatic Gauge	-	38.10	-	-	-	-	-	-	-	-	-	-	-		
E	Stairway Bottom	-	42.90	-	-	-	-	-	-	-	-	-	-	-		
F	Nozzle	6	61.90	5.50	16	12	1.081	K	1	0.309	0.981	-	Y	F		
G	Grounding Lug	-	74.40	-	-	-	-	-	-	-	-	-	-	-		
H	Platform	-	86.00	-	-	-	-	-	-	-	-	-	-	-		
I	Manway	30	90.00	35	74	62	1.078	A	1	1.066	0.610	0.628	Y	3.50		
J	Nozzle	6	142.40	8.50	20	16	1.023	K	1	0.430	0.974	-	Y	F		
K	Nozzle	6	155.50	7.5	20	15.50	1.057	K	1	0.429	1.058	-	Y	F		
L	Grounding Lug	-	262.30	-	-	-	-	-	-	-	-	-	-	-		
M	Manway	24	273.35	35	60	50	1.079	A	1	1.054	0.548	0.526	Y	10		
N	Grounding Lug	-	356.30	-	-	-	-	-	-	-	-	-	-	-		
O	Nozzle	6	391.30	7.50	20	15.50	1.055	K	1	0.415	1.048	-	Y	F		
P	Grounding Lug	-	450.30	-	-	-	-	-	-	-	-	-	-	-		
Q	Manway	30	496.10	35	74	62	1.082	A	1	1.042	0.563	1.202	Y	4	w/ Mixer	
R	Nozzle	4	526.60	5.50	16	12	1.076	K	1	0.340	0.954	-	Y	F		
S	Nozzle	12	529.70	12	128	72	1.210	K	1	0.480	1.257	-	Y	F		
T	Nozzle	32	535.35	36	128	72	1.210	K	1	0.632	2.536	-	Y	F		
U	Valve Platform	-	540.00	-	-	-	-	-	-	-	-	-	-	-		
V	Vertical Ladder	-	543.65	-	-	-	-	-	-	-	-	-	-	-		
W	Nozzle	2	549.35	48	-	-	-	-	-	0.203	0.780	-	-	46		
X	Nozzle	2	549.35	-	-	-	-	-	-	-	-	-	-	-	Course 2	
Y	Manway	30	574.60	35	74	62	1.078	A	1	1.060	0.612	1.290	Y	4.50	w/ Mixer	
Z	Nozzle	6	626.90	7.50	20	15.50	1.061	K	1	0.419	1.049	-	Y	F		

The stations are measured circumferentially counterclockwise from Cleanout A

Shape



**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 33 of 59

**4.4.2 NOZZLE AND APPURTENANCE TABLE (CONT'D.)**

Item	Description	Pipe Size (in.)	Station (ft.)	CL Elev. (in.)	Reinforcing Plate					1 or 2 Piece	Neck Thick (in.)	Flange Thick (in.)	Cover Thick (in.)	Tell-tale	Weld Space (in.)	Comments
					Width (in.)	Height (in.)	Thick (in.)	Shape								
AA	Grounding Lug	-	648.90	-	-	-	-	-	-	-	-	-	-	-	-	
BB	Grounding Lug	-	732.10	-	-	-	-	-	-	-	-	-	-	-	-	
CC	Manway	24	744.90	35	60	50	1.079	A	1	1.062	0.451	1.330	Y	10	w/ Mixer	
DD	Grounding Lug	-	826.10	-	-	-	-	-	-	-	-	-	-	-	-	
EE	Nozzle	6	862.70	7.50	20	15.50	1.058	K	1	0.424	1.054	-	Y	F		
FF	Manway	24	888.95	35	60	50	1.079	A	1	1.061	0.506	0.498	Y	F		
GG	Grounding Lug	-	919.85	-	-	-	-	-	-	-	-	-	-	-	-	
	Total strapped Circumference	-	942.97	-	-	-	-	-	-	-	-	-	-	-	-	

The stations are measured circumferentially counterclockwise from Cleanout A

Shape



**COURSE 1 VERTICAL WELD LOCATIONS:**

1) 6.22	2) 45.54	3) 84.80	4) 124.10	5) 163.37	6) 202.67	7) 241.97	8) 281.25	9) 320.54
10) 350.56	11) 359.85	12) 399.15	13) 438.45	14) 477.74	15) 517.03	16) 524.63	17) 543.05	18) 556.28
19) 595.60	20) 634.85	21) 674.15	22) 713.43	23) 752.74	24) 792.05	25) 831.34	26) 870.62	27) 909.91
28) 936.77								

**COURSE 2 VERTICAL WELD LOCATIONS:**

1) 25.90	2) 65.10	3) 104.50	4) 143.70	5) 183.00	6) 222.30	7) 261.60	8) 300.90	9) 340.30
10) 379.55	11) 418.90	12) 458.15	13) 497.40	14) 536.70	15) 575.80	16) 615.25	17) 654.55	18) 693.80
19) 733.10	20) 772.35	21) 811.65	22) 850.90	23) 890.20	24) 929.50			

**VERTICAL WELD OFFSET FOR COURSES 3, 4, 5, etc.:**

3) 6.22	4) 25.90							
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**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 34 of 59

**4.4.2 NOZZLE AND APPURTENANCE TABLE (CONT'D.)**

**SUPPLEMENTAL NOZZLE UT**

Nozzle ID	Clock Position				
Item	12	3	6	9	Average
A	1.126	1.250	--	1.233	1.203
B	0.258	0.209	0.246	0.231	0.236
C	0.210	0.200	0.181	0.188	0.195
F	0.344	0.328	0.309	0.344	0.331
I	1.068	1.070	1.071	1.066	1.069
J	0.444	0.446	0.453	0.430	0.443
K	0.442	0.440	0.429	0.442	0.438
M	1.054	1.056	1.055	1.063	1.057
O	0.426	0.415	0.440	0.448	0.432
Q	1.042	1.074	1.070	1.079	1.066
R	0.340	0.344	0.343	0.341	0.342
S	0.480	0.480	0.501	0.482	0.486
T	0.632	0.656	0.656	0.636	0.645
W	0.216	0.203	0.218	0.218	0.214
Y	1.060	1.069	1.065	1.087	1.070
Z	0.445	0.446	0.432	0.419	0.436
CC	1.062	1.064	1.090	1.070	1.072
EE	0.436	0.441	0.424	0.440	0.435
FF	1.069	1.069	1.061	1.065	1.066

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 35 of 59

## 4.6 FLOATING ROOF

### 4.5.1 FLOATING ROOF INSPECTION CHECKLIST

ITEM NO.	FLOATING ROOF	INSPECTION COMMENTS
<b>FLOATING ROOF PRIMARY MECHANICAL SHOE SEAL</b>		
FLR1	Inspect seal condition, hangers, shoes (system vapor barrier, and attachment hardware) (ref. API 653, Paras. 4.2.3.3 & 6.2.3).	N/A
<b>FLOATING ROOF PRIMARY FOAM LOG SEAL</b>		
FLR2	Inspect seal fabric, foam, hardware (ref. API 653, Para. 4.2.3.3).	N/A
<b>FLOATING ROOF PRIMARY SEAL (OTHER)</b>		
FLR3	Type of primary seal (ref. API 653, Para. 4.2.3.3).	N/A
FLR4	Check for mechanical damage, corrosion (wear on tip from contact with shell) (ref. API 653, Para. 4.2.3.3).	N/A
FLR5	Measure seal gaps at regular intervals and record any visible seal damage (ref. API 653, Para. 4.2.3.3).	N/A
FLR6	Conduct Visual inspection of bolts and fasteners, with special attention to product interface areas (ref. API 653, Para. 4.2.3.3).	N/A
<b>FLOATING ROOF SECONDARY SEAL</b>		
FLR7	Type of rim-mounted secondary seal. (ref. API 653, Para. 4.2.3.3)	N/A Type: Metallic Wiper
FLR8	Check for mechanical damage, corrosion (wear on tip from contact with shell) (ref. API 653, Para. 4.2.3.3).	N/A
FLR9	Measure seal gaps at regular intervals and record any visible seal damage (ref. API 653, Para. 4.2.3.3).	N/A
FLR10	Conduct Visual inspection of bolts and fasteners, with special attention to product interface areas (ref. API 653, Para. 4.2.3.3).	N/A

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 36 of 59

<b>FLOATING ROOF (CONT'D.)</b>		
<b>FLOATING ROOF LEGS</b>		
FLR11	Floating roof support legs. Record sizes and locate on layout. Count floating roof legs and match number on Layout(s) (ref. API 653, Paras. 4.2.3 & 9.10.2.1.5).	N/A
FLR12	Visual inspection of floating roof legs (bending, thinning or buckling) (ref. API 653, Para. 4.2.3 & API 650, Paras. C.3.3.3, C.3.10 & H.6.4).	N/A
FLR13	Condition of roof leg sleeves (cracking, thinning, buckling and presence of drain notch) (ref. API 653, Para. 4.2.3 & API 650, Paras. C.3.3.3 & C.3.10).	N/A
FLR14	Condition of roof leg reinforcing pads (cracking, buckling & inspect gussets) (ref. API 653, Para. 4.2.3).	N/A
FLR15	Roof leg pins (corrosion, sticking, missing) (ref. API 653, Para. 4.2.3)	N/A
FLR16	All roof legs at the same level (floating roof level) (ref. API 653, Paras. 4.2.3 & 9.10.2.1.5).	N/A
<b>FLOATING ROOF APPURTENANCES</b>		
FLR17	Binding of roof columns or supports (ref. API 653, Para. 4.2.3).	N/A
FLR18	Damage to ladder or column wells and covers (ref. API 653, Para. 4.2.3).	N/A
FLR19	Bonding static cable attached and in good condition (ref. API 653, Paras. 4.2.3 & 6.3.2.3) (API 650, Para. H.4.1.6).	N/A
FLR20	Roof drain sump condition (clean and free of debris) (ref. API 653, Para. 4.2.3 & API 650 Para. H.4.1.6).	N/A
FLR21	Inspect rolling ladder or vertical ladder assembly (ref. API 653, Paras. 4.2.3 & 4.2.3.3) (API 650 Paras. C.3.7 & H.5.1).	N/A
FLR22	Identify type, number and condition of anti-rotation details (ref. API 653, Para. 4.2.3 & API 650, Para. H.5.4).	N/A

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 37 of 59

<b>FLOATING ROOF (CONT'D.)</b>		
<b>FLOATING ROOF APPURTENANCES (CONT'D.)</b>		
FLR23	Inspect & report gauge pole diameter and type (ref. API 653, Para. 4.2.3 & API 650, Paras. C.3.3.6, C.3.14 & H.5.7).	N/A
FLR24	Inspect manway and appurtenances (ref. API 653, Para. 4.2.3 & API 650, Paras. C.3.3.6 & H.5.5).	N/A
FLR25	Inspect Vacuum Breaker, rim vent, gauge hatch, gasket, etc. Record size and location on layout (ref. API 653, Para. 4.2.3 & API 650, Paras. C.3.3.6, C.3.9, C.3.15.3 & H.5.2.1).	N/A
<b>FLOATING ROOF – GENERAL</b>		
FLR26	Levelness / condition of floating deck (ref. API 653, Paras. 4.2.3 & 9.10.2.1.5).	Acceptable
FLR27	Signs of product on the floating roof (May indicate loss of flotation) (ref. API 653, Para. 4.2.3).	Acceptable
<b>EXTERNAL FLOATING ROOF</b>		
FLR28	Condition of roof plates / welds (corrosion, coating failure, leaks, and debris on roof) (ref. API 653, Para. 4.2.3).	Reference Section 2.0
FLR29	Inspect pontoons for water, product, residue and vapors. Check for presence of lock-down attachments on pontoon covers (ref. API 653, Paras. 4.2.3 & 9.12.3 & C.1.5.13) (ref. API 650, Para. C.3.5).	N/A
<b>ALUMINUM PONTOON FLOATING ROOF</b>		
FLR30	Check floating roof condition (rips, tears, buckled member, condition of hardware, broken or missing parts, product in panels) (ref. API 653, Para. 4.2.3).	N/A
FLR31	If the floating roof has deck drains, check that all drains have working closures and bottom side tubes are below the product level.	N/A
FLR32	Inspect aluminum pontoons for product inside.	N/A
<b>ALUMINUM FULL-CONTACT FLOATING ROOF</b>		
FLR33	Check floating roof condition (rips, tears, buckled member, condition of hardware, broken or missing parts, product in panels) (ref. API 653, Para. 4.2.3).	N/A
FLR34	Check manway latches for workability and ensure that all opening manways are self-closing (should not be open while in-service).	N/A
<b>INTERNAL STEEL FLOATING ROOF</b>		
FLR35	Visual inspection for signs of corrosion or pitting on top and product side surfaces (ref. API 653, Para. 4.2.3).	N/A
FLR36	Visual inspection of all welds (ref. API 653, Para. 4.2.3).	N/A
FLR37	List any limitations to the floating roof inspection.	Reference Section 2.0

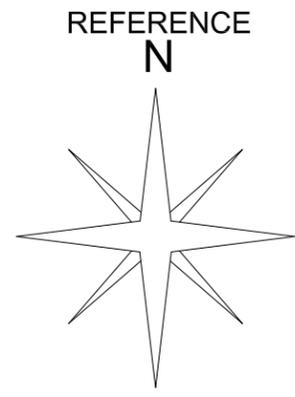
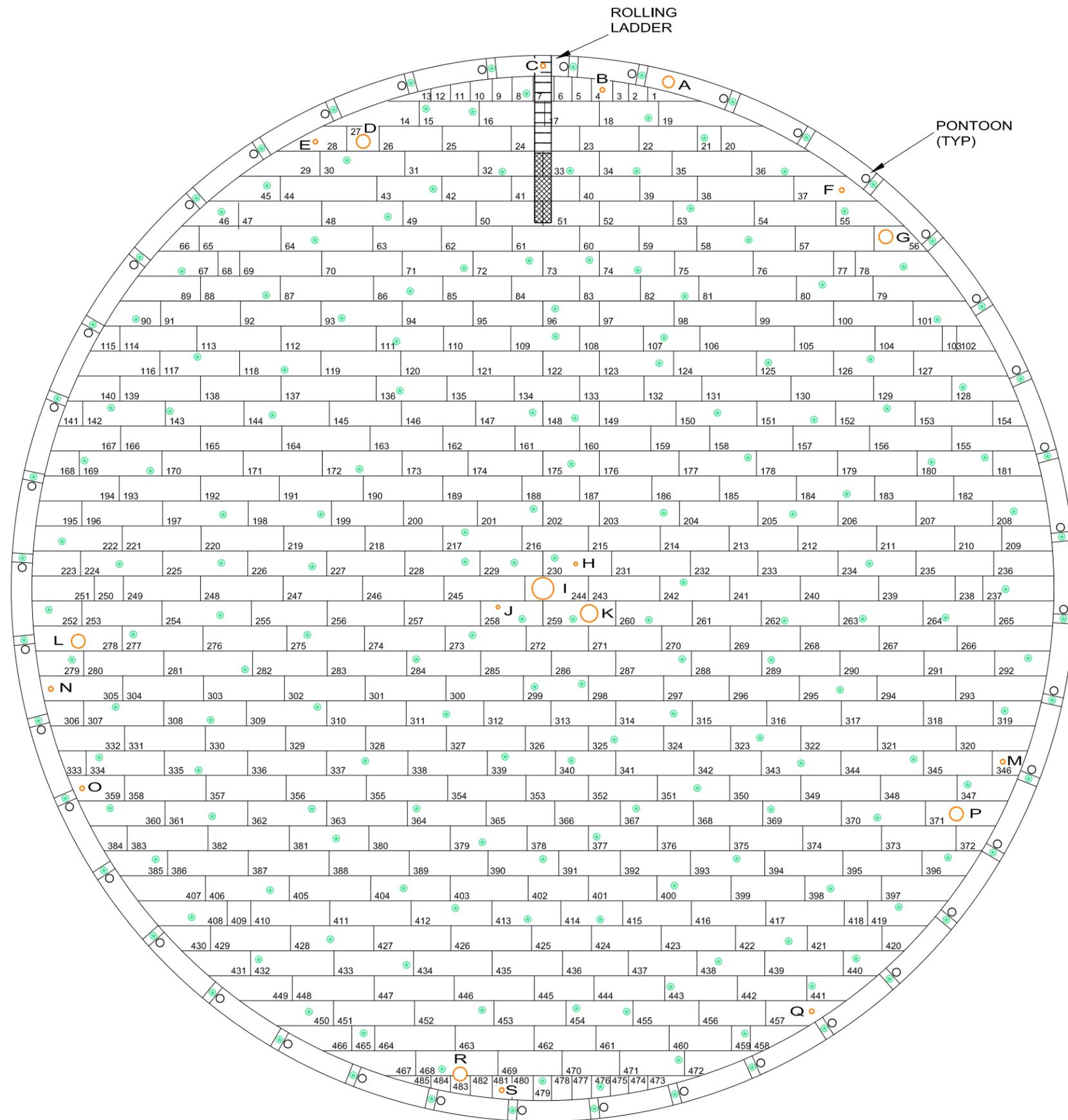
**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 38 of 59

**4.5.2 FLOATING ROOF NOZZLE TABLE**

Item	Description	Pipe Size (in.)	Location Plate No.	Neck Thick (in.)	Comments
A	Automatic Gauge	20	Pontoon	--	
B	Gauge Hatch	8	4	--	
C	Anti-Rotation / Gauge	8	Pontoon	--	
D	Manway	24	27	--	w/ Gauge Hatch
E	Vacuum Breaker	8	28	--	
F	Vacuum Breaker	8	37	--	
G	Manway	24	56	--	w/ Gauge Hatch
H	Gauge Hatch	2	230	--	
I	Center Drain	32	244	--	
J	Gauge Hatch	6	258	--	
K	Manway	30	259	--	
L	Manway	24	278	--	w/ Gauge Hatch
M	Vacuum Breaker	8	346	--	
N	Vacuum Breaker	8	305	--	
O	Gauge Hatch	8	359	--	
P	Manway	24	371	--	w/ Gauge Hatch
Q	Gauge Hatch	8	457	--	
R	Manway	24	468 / 483	--	w/ Gauge Hatch
S	Vacuum Breaker	8	481	--	



**NOZZLES**

- A = 20" AUTOGAUGE
- B = 8" GAUGE HATCH
- C = 8" ANTI-ROTATION / GAUGE
- D = 24" MANWAY W/ GAUGE HATCH
- E = 8" VACUUM BREAKER
- F = 8" VACUUM BREAKER
- G = 24" MANWAY W/ GAUGE HATCH
- H = 6" GAUGE HATCH
- I = 32" CENTER DRAIN
- J = 6" GAUGE HATCH
- K = 30" MANWAY
- L = 24" MANWAY W/ GAUGE HATCH
- M = 8" VACUUM BREAKER
- N = 8" VACUUM BREAKER
- O = 8" GAUGE HATCH
- P = 24" MANWAY W/ GAUGE HATCH
- Q = 8" GAUGE HATCH
- R = 24" MANWAY W/ GAUGE HATCH
- S = 8" VACUUM BREAKER

**GENERAL**

TYPE OF ROOF :  
LAP WELDED ANNULAR PONTOON  
w/ DECK PONTOONS

Y X REFERENCE CORNER

**LEGEND**

⊗ = FLOATING ROOF LEG



**HMT INSPECTION**  
8979 MARKET STREET RD  
HOUSTON, TX 77029-3421

TITLE: <b>FLOATING ROOF LAYOUT</b>	
OWNER: <b>SHELL PIPELINE COMPANY, LP</b>	
TANK NO: <b>6</b>	JOB NO: <b>224-42016</b>
DRAWN BY: <b>J.NAUGLE</b>	DATE: <b>12 JAN 2016</b>

DRAWING NOT TO SCALE

## **5.0 NDT INSPECTION**

### **5.1 NDT INSPECTION SCOPE**

The following Nondestructive Testing (NDT) was conducted to evaluate the physical characteristics of the tank:

- A) Visual (VT) inspection of areas for the detection of anomalies or significant product side metal loss which may affect the integrity. Performed in accordance with HMT Inspection VT Procedure No. 1611.9, Revision No. 4.
- B) Random Ultrasonic (UT) testing. Performed in accordance with HMT Inspection UT Procedure No. 1611.1, Revision No. 7.
- C) Automated Ultrasonic (UT) scanning (B-Scan). Performed in accordance with HMT Inspection UT Procedure No. 1611.3, Revision No. 1.

### **5.2 SHELL INSPECTION**

External shell welds were inspected utilizing VT inspection method.

Shell plate UT data was collected utilizing random readings. Ten (10) readings were taken per course up the spiral stairway (ref. Section 4.3.4).

Shell plate UT data was collected utilizing random readings. Readings were taken along ten (10) vertical B-Scan drops, evenly spaced, around the shell (counterclockwise from Cleanout A) (ref. Section 3.2.4).

### **5.3 NOZZLE INSPECTION**

External shell nozzle welds were inspected utilizing VT inspection method.

Shell nozzle UT data was collected utilizing random readings. One (1) reading per reinforcing pad, flange face, and cover (when applicable) was taken. Four (4) readings per nozzle neck at 0°, 90°, 180°, and 270° were taken (ref. Section 4.4.2).

### **5.4 FLOATING ROOF INSPECTION**

External floating roof plates were inspected utilizing VT inspection method.

## 6.0 EQUIPMENT

### 6.1 ULTRASONIC

UT equipment utilized for the inspection was a Panametrics EPOCH LT Flaw Detector.

Transducer equipment utilized was a BRITEK 7.5 MHz, 0.312 inch dual element.

Calibration block equipment utilized was a 5 step, carbon steel test block.

Echogel 20 and water were used as a couplant.

**B-Scan:** ScanTech C-1 Spider with GE, 7.5 MHz, 5 inch bubbler transducer, and a Sonotest Masterscan 330.

### 6.2 LEVEL

Level equipment utilized was a Spectra Precision LL300 self-leveling rotating laser.

**API 653 In-Service Inspection Report  
for  
Shell Pipeline Company, LP  
Tank No. 6  
St. James, LA**



January 11 – 12, 2016  
Page 42 of 59

## **7.0 WARRANTY**

### **WARRANTY**

HMT Inspection, a division of HMT LLC (“HMT”), has evaluated the condition of this tank based on the observations and measurements made by the HMT Tank Inspector and within API 653 guidelines. 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 HMT 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, HMT warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, HMT 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 HMT 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 HMT 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 HMT or any associated damage to facilities, down-time costs or claims of other damages.

8.0 PHOTOGRAPHS



Tank No. 6 Stand-off



Tank Stand-off



Tank Stand-off



Tank Stand-off

8.0 PHOTOGRAPHS



Foundation Stand-off



Foundation Stand-off



Foundation Stand-off



Foundation Stand-off



Foundation Stand-off



External Section of Moisture Barrier



Mildew on Wind Girder



Mildew on Wind Girder



Mildew Present on Wind Girder



Standing Water and Mold on Wind Girder



Nameplate



Cleanout A



Nozzle B



Temperature Gauge Broken



Nozzle C



Automatic Gauge D



Stairway Bottom E



Nozzle F



Grounding Lug G



Manway I



Nozzle J



Nozzle K

8.0 PHOTOGRAPHS



Grounding Lug L



Manway M



Nozzle O



Manway Q



Nozzle R



Nozzle S



Nozzle T



Nozzle T



Valve Platform U and Vertical Ladder V



Nozzle W



Nozzle X



Manway Y



Nozzle Z



Grounding Lug



Manway CC



Nozzle EE



Manway FF

## 8.0 PHOTOGRAPHS



Floating Roof Stand-off



Floating Roof Stand-off



Floating Roof Stand-off



Floating Roof Stand-off

8.0 PHOTOGRAPHS



Coating Failure



Coating Failure and Rust



Standing Water on Pontoon Deck



Standing Water on Roof Deck

## 8.0 PHOTOGRAPHS



Standing Water on Roof Deck



Tank Platform



Rolling Ladder



Rolling Ladder and Runway



Secondary Seal



Gauge Pole and Secondary Seal



AMERICAN PETROLEUM INSTITUTE  
INDIVIDUAL CERTIFICATION PROGRAMS

## API Individual Certification Programs

certifies that

*Fausto Alejandro Maldonado*

has met the requirements to be a certified

*API-653 Above Ground Storage Tank Inspector*

Certification Number *25916*  
Original Certification Date *April 30, 2004*  
Current Certification Date *April 30, 2013*  
Expiration Date *April 30, 2016*

*Tina Briskin*

Manager, Individual Certification Programs



# Certificate of Qualification



## INSPECTION

This is to Certify

*Fausto Alejandro Maldonado*

is qualified in accordance with the HMT Procedure for Qualification and Certification of Nondestructive Examination Personnel which is in compliance with the requirements of the American Society for Nondestructive Testing Recommended Practice SNT-TC-1A-2011 ed.

<u>Method</u>	<u>Level</u>	<u>Expiration Date</u>
API 653	No. 25916	04/30/2016
API 570	No. 34334	01/31/2018

*Hugh K. Howerton*

Hugh K. Howerton  
ASNT Level III

January 30, 2015

Date

# Certificate of Qualification



## INSPECTION

This is to Certify

*Luch "Lea" Neang*

is qualified in accordance with the HMT Procedure for Qualification and Certification of Nondestructive Examination Personnel which is in compliance with the requirements of the American Society for Nondestructive Testing Recommended Practice SNT-TC-1A-2011 ed.

<u>Method</u>	<u>Level</u>	<u>Expiration Date</u>
MFL	II	05/26/2020
UTt	II	05/27/2020
MTy	II	05/26/2020
LT/BT	II	05/27/2020

*Hugh K. Howerton*

Hugh K. Howerton  
ASNT Level III

May 27, 2015

Date

# Certificate of Qualification



## INSPECTION

This is to Certify

*Daniel Pearch*

is qualified in accordance with the HMT Procedure for Qualification and Certification of Nondestructive Examination Personnel which is in compliance with the requirements of the American Society for Nondestructive Testing Recommended Practice SNT-TC-1A-2006 ed.

<u>Method</u>	<u>Level</u>	<u>Expiration Date</u>
LT/BT	II	10/18/2018
MFL	II	10/18/2018

*Hugh K. Howerton*

Hugh K. Howerton  
ASNT Level III

MAY 20, 2014

Date

# 18TS6S3 – External Inspection Checklist

TANK INFORMATION											
SYSTEM NAME (RAM/SAP Level 1)			TANK LOCATION St. James, LA (RAM/SAP Level 2)				REGION Southeast				
SERVICE OR PRODUCT Crude Oil					TANK NUMBER 6			DATE 01/11/2016			
MANUFACTURER Graver Tank & Mfg Co.					DATE CONSTRUCTED 1979						
TANK DIAMETER (FT & IN) 300.00			TANK HEIGHT (FT & IN) 36.83		NOMINAL CAPACITY 418.707 bbls.						
TODAY'S DATE 01/11/2016					DATE OF LAST EXTERNAL INSPECTION December 2010						
<b>ROOF TYPE</b> <input type="checkbox"/> Fixed Cone <input type="checkbox"/> Geodesic Dome <input checked="" type="checkbox"/> External Floater <input type="checkbox"/> Internal Steel Floater <input type="checkbox"/> Internal Aluminum Floater											
<b>SHELL</b> <input type="checkbox"/> Riveted <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Bolted					<b>BOTTOM</b> <input type="checkbox"/> Riveted <input checked="" type="checkbox"/> Welded						
<b>FOUNDATION</b> <input checked="" type="checkbox"/> Concrete Ring <input type="checkbox"/> Earthen Pad <input type="checkbox"/> Shell <input type="checkbox"/> Other											
<b>INSTRUCTIONS</b> 1. Mark X under the Condition code on the checklist that best fits the condition of the item being inspected. 2. Black squares indicate the Condition Code is not available for that inspection item. 3. Shaded squares indicate a condition that requires additional evaluation or repair. 4. Comments <b>are required</b> for all conditions marked X in shaded squares. When necessary, extend comments to page 4 of 12 on the form. 5. Further instructions and guidelines are in other sections of this manual.											
<b>CONDITION CODES</b> <b>Code 0</b> Not Applicable <b>Code 1</b> Condition warrants immediate action or verbal communication. Possible equipment shutdown. <b>Code 2</b> Condition requires repairs be scheduled for the soonest possible time. <b>Code 3</b> Condition requires scheduled repairs and possible further investigation and/or inspection. <b>Code 4</b> Condition requires minor maintenance repairs. <b>Code 5</b> No damage or failures noted. <b>Code 9</b> Used only to report items not covered in the procedure that may affect system performance.											
<b>SAFETY</b>											
					Acceptable (Mark X)		Comments (required if not acceptable)				
					Yes	No					
1. Observe entire tank and surroundings from firewall for entry					x						
2. Tank access ladder and platform structurally sound					x						
3. Tank roof structurally sound					x						
<b>SURROUNDING AREA</b>											
					Condition Codes (Mark X)				Comments		
					0	1	2	3	4	5	9
<b>Surrounding Area</b>											
4. Flammable materials stored inside firewall					x						
5. Site drainage away from tank, piping, and manifolds									x		
6. General housekeeping around the tank (trash, vegetation, debris)									x		
7. Dike condition (breeches and other deterioration)									x		
6. Concrete ring (cracks, breaks, spalling, exposed rebar)								x			Surface cracks
7. Concrete ring drains are free of debris									x		
<b>Foundation</b>											
8. Top of concrete ring sloped away from tank									x		
9. Earthen pads eroded from water running off the tank									x		
10. Indications of bottom leaks									x		
11. Cavities or voids under tank									x		
12. Settlement indications (see instructions, Page 12 of 14)									x		

# 18TS6S3 – External Inspection Checklist

	Condition Codes (Mark X)							Comments
	0	1	2	3	4	5	9	
13. Bottom extension drains away from tank (welded bottom)						x		
14. Bottom extension (corroded, pitting, thinning)						x		
15. Chime weld corroded or pitted						x		
15. Shell-to-bottom weld and chime area free of dirt and sand						x		
<b>TANK SHELL</b>								
16. Bottom extension welds (pitting, corrosion, undercuts)						x		
16. Visual signs of corrosion of other metal components						x		
17. Overall condition of foundation						x		
16. Overall condition of shell						x		
17. Condition of bottom extension seal to foundation						x		
18. Condition of earth grounding cables and connectors						x		
19. Insulation (cracking, leaking, moisture under weather coat)	x							
20. Shell pitted or corroded (See API 653, Section 2.3)						x		
21. Any coating failure						x		
21. Deformation of shell (banding, peaking, bulging, flat spots)						x		
22. Indications of shell leaks (observe seams closely)						x		
23. Condition of rivets (work, corroded, loose rivet sealer)	x							
24. Shell-to-bottom weld (condition, corrosion, weld defects, etc.)						x		
24. Condition of seam welds (pitted, corroded, or undercut)						x		
26. Tolerances for roundness, plumbness						x		
<b>SHELL APPURTENANCES</b>								
25. Excessive dimpling of shell plate or bowing of piping						x		
26. Weld spacing vs. API-53 rules					x			
26. Leakage around support and reinforcement plate welds						x		
27. Attachment supports (corrosion, defects)						x		
27. Reinforcing plates under supports (existing, size, welding)						x		
27. Indications of leakage around manways and nozzles						x		
28. Indications of leakage around flange bolts and welds						x		
29. Sample connection valves (leaking, operational)	x							
30. Leakage around swing line threaded and flanged joints	x							
31. Leakage around autogauge guides and sheave housing						x		
32. Leakage around shaft seal (tank mixer)						x		
33. Leakage of valve packing glands						x		
34. Condition of welds on davits/davit clips (valves, mixers, clean-outs)						x		
35. Windgirder, supports, handrails, top angle (corrosion, weld failure)						x		
36. Windgirder (dust/dirt buildup, paint failure)					x			Mildew present
37. Temperature indicators (corrosion, mechanical damage)					x			Out-of-service
37. Operability of gauging devices (water in gauges, etc.)	x							
38. Autogauge system (corrosion, mechanical damage)					x			Mechanical shoe

# 18TS6S3 – External Inspection Checklist

39. Autogauge tape free to move and legible (also oil fill in cold climates)					x					Not legible
	Condition Codes (Mark X)								Comments	
	0	1	2	3	4	5	9			
40. High level alarm (mechanical damage)						x				
41. Firefighting system (corrosion, mechanical damage)						x				
42. Spray nozzles (blockage)	x									
43. Chemicals usable (shelf life)	x									
44. Tank mixer mounting base (weld failure, structural damage)						x				
45. Tank mixer mounting base (loose bolts)						x				
46. Noise level during tank mixer operation						x				
47. Vents in upper shell and overflow slots	x									
48. Nameplate bracket conditions (corrosion, damage)						x				
48. Piping without flexibility (no bends)						x				
48. Signs of corrosion						x				
49. Paint deterioration						x				
<b>ACCESS STRUCTURE (Note: The inspection should be terminated if the access structure is determined to be unsafe.)</b>										
48. Ladder attachments to concrete base (corrosion, broken)	x									
49. Welds on stairways and ladders stringers (corrosion, broken)						x				
50. Welds on spiral stairway to shell (corrosion, broken)						x				
51. Stairways and ladders (corrosion, broken, paint failure)						x				
52. Handrails (corrosion, pitting, broken welds, paint failure)						x				
53. Stairway/ladder treads securely attached to stringers						x				
54. Safety drop bar or safety chain provides adequate protection						x				
55. Gauger platform frame and supports (corrosion, broken)						x				
56. Gauger platform deck (corrosion, paint or weld failure)						x				
57. Rolling roof ladder/handrail (corrosion, paint or weld failure)						x				
58. Hazardous openings in handrail on rolling roof ladder						x				
59. Rolling roof ladder attachment to shell (corrosion, wear)						x				
60. Self-leveling of rolling roof ladder treads (when applicable)						x				
61. Treads on rolling ladder (wear, corrosion, damage)						x				
61. Alignment of rolling roof ladder with roof rails						x				
62. Rolling roof ladder rails (welds, corrosion, wear)	x									
63. Rolling roof ladder wheels, axle, and securing pins to axle	x									
64. Rolling ladder static cables (frayed, end connections)						x				
<b>TANK ROOF</b>										
<b>Cone Roof</b>										
65. Roof deck (depressed areas)	x									
66. Indications of standing water on roof deck	x									
67. Deck plates (corrosion, pitting, holes, paint failure)	x									
<b>Geodesic Dome</b>										
68. Perimeter flashing (wind damage)	x									
69. Evidence of leaking panels (water spots on internal floater)	x									
70. Deterioration or crazing of skylight (caused by UV light)	x									

# 18TS6S3 – External Inspection Checklist

71. Panel caulking and rubber seals (entire roof)	x										
<b>External Floating Roof</b>											
	Condition Codes (Mark X)								Comments		
	0	1	2	3	4	5	9				
72. Floating roof housekeeping (clean, free of rags and debris)					x						
73. Corrosion, pitting, or cracked welds on floating roof	x										
74. Standing water or product on the floating roof deck					x					Standing water	
75. Levelness of floating roof (visual observation)						x					
76. Water, product, or spent abrasive in the pontoon compartments	x										
77. Condition of floating roof ground connections and cables						x					
78. Mechanical shoes damaging shell or coating	x										
79. Comment when legs are pinned for high roof operation	x										
<b>Internal Floating Roof</b>											
80. Signs of product on the deck (may indicate loss of floatation)	x										
81. Binding with shell or columns	x										
82. Damage or slack in anti-rotational cable	x										
83. Missing roof support legs	x										
84. Damage to ladder or column wells and covers	x										
85. Comment when legs are pinned for high roof operation	x										
<b>ROOF APPURTENANCES</b>											
86. Manway covers secured in place and in good condition						x					
87. Pontoon covers secured in place and in good condition						x					
88. Weld conditions (corrosion, cracks, other defects)	x										
88. Open vents (clean and free of debris)	x										
89. Vacuum pressure vent pallet assembly seals (weathering)	x										
90. Vacuum pressure vent screens (clean and free of debris)	x										
91. Flame arrestor (mechanical integrity)	x										
92. Gauge hatch (clean, operates freely, seals properly)	x										
93. Drain return to tank at gauge hatch clear and operational	x										
94. Stenciled gauging data is legible	x										
95. Floating roof support legs (corrosion, pitting, bending)						x					
96. Roof leg sleeves and retaining pins (corrosion, cracks, or bending)	x										
97. Roof leg cotter pins (corrosion, missing)	x										
98. Roof leg sleeve reinforcement pads (bending, cracking)	x										
99. All roof legs at the same level						x					
99. All parts intact (none missing)	x										
100. Emergency overflow screens clean and free of debris	x										
101. Roof drain sump clean and free of debris	x										
102. Corrosion damage to roof drain sump	x										
103. Weld failure on roof drain sump	x										
104. Roof drain check valve free of corrosion and debris	x										
105. Verify roof drain check valve operates freely	x										





# 18TS6S3 – External Inspection Checklist

SHELL LAYOUT					
Instructions					
1) Show Stairway and Appurtenances		2) Show Pitting Corrosion, and Paint Failure		3) Show Shell Deformation (Bulging, Peaking, etc.)	
N	W	S	E	N	
				C10	
				C09	
				C08	
				C07	
				C06	
				C05	
				C04	
				C03	
				C02	
				C01	
← Measured Circumference		Ft	In	→	
Appurtenances					
1. Manway	5. Swing Line Suction Nozzle	9. Transfer/Recirculating Nozzle	13. Miscellaneous Nozzle	17. Overflow Nozzle	21. Other _____
2. Fill Nozzle	6. Mixer Nozzle	10. Steam Coil Inlet	14. Spiral Stairway	18. Thermowell	
3. Suction Nozzle	7. Jet Nozzle	11. Condensate Outlet	15. Windgirder	19. Radial or Vertical Ladder	
4. Low Suction Nozzle	8. Water Draw Nozzle	12. Air Spider Nozzle	16. Foam Chamber	20. Other	
TANK NO. 6	LOCATION St. James, LA	TANK DIAMETER	300.00 (FT.)	TANK HEIGHT	36.83 (FT.)

# 18TS6S3 – External Inspection Checklist

## ROOF

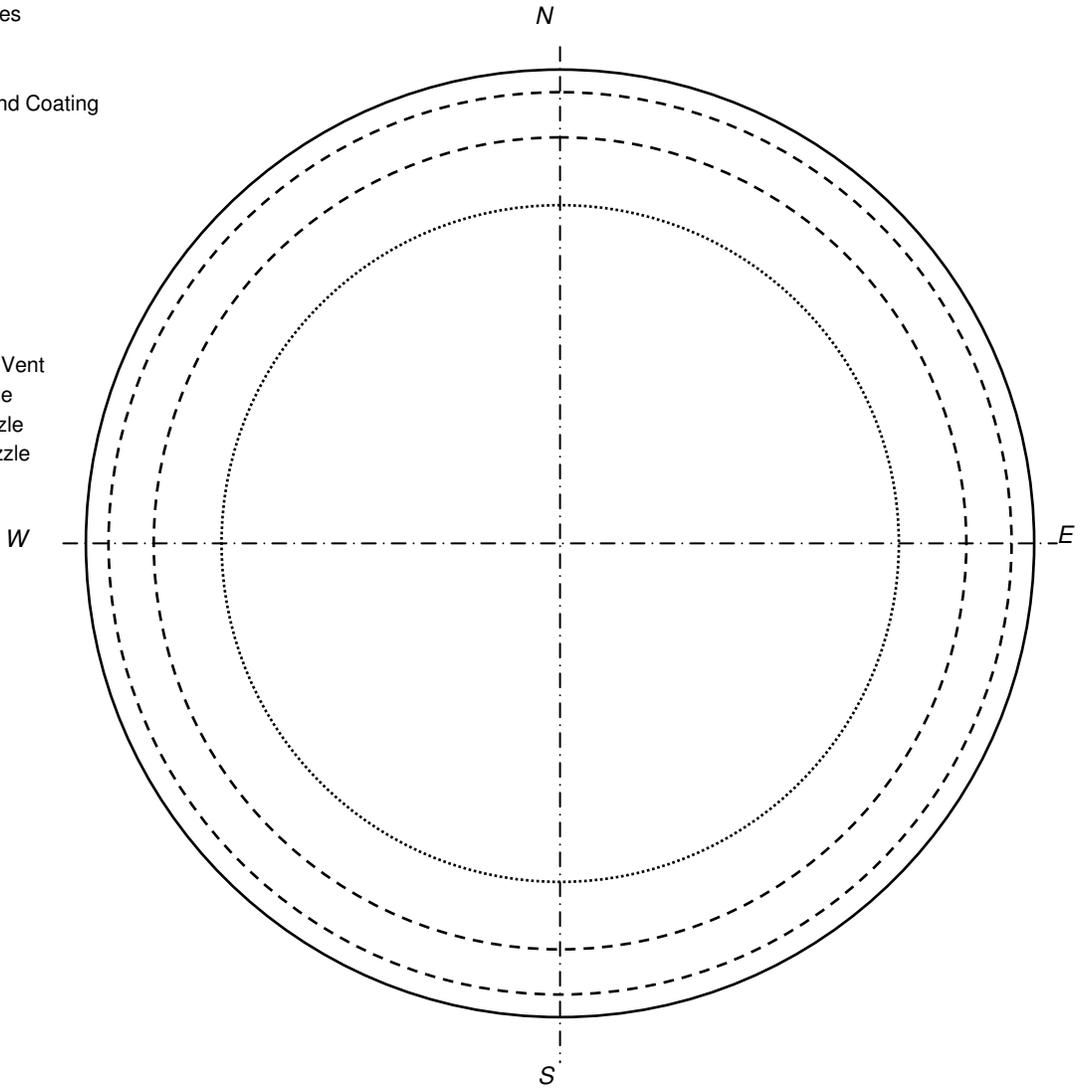
### INSTRUCTIONS

Print this sheet and fill in information manually - sketch details, etc.  
 Stairway and Appurtenances  
 Show Plate Layout  
 Show UT Readings  
 Show Pitting, Corrosion, and Coating Failure

### APPURTENANCES

- A. Manway
- B. Internal Roof Access
- C. Vent Nozzle
- D. Gauge Hatch Nozzle
- E. Vacuum Vent
- F. Emergency Overflow Vent
- G. Gas Blanketing Nozzle
- H. Overhead Vapor Nozzle
- I. High Level Alarm Nozzle
- J. Air Circulation Hood
- K. Conservation Vent
- L. Rolling Ladder
- M. Automatic Bleeder Vent
- N. Gauge Well
- O. Roof Drain
- P. Rim Vent
- Q. Other
- R. Other
- S. Other

Column: .....  
 Pontoons: .....



PLANT  
 St. James, LA

TANK NO.  
 6

Internal Roof

External Roof

SPECIFIED PLATE  
 THICKNESS

INSPECTOR  
 Fausto Alejandro Maldonado

DATE  
 01/11/2016



# 18TS6S3 – External Inspection Checklist

<b>SHELL SETTLEMENT DATA</b>	
INSTRUCTIONS: Refer to API Standard 653 (Section 12.5 and Appendix B) and Shell's Alternative Criteria. Also, see Appendix C of 18TS007	
Visual – Does the tank exhibit any indications of settlement?	
<input type="checkbox"/> No    Defer settlement survey to out-of-service inspection.	
<input type="checkbox"/> Yes    Explain and attach out-of-plane settlement evaluation.	
SURVEY INFORMATION	SURVEY POINT ELEVATIONS
SURVEY COMPANY	DATE
SURVEY POINT SEPARATION (must be uniform, 32' max.)	Point No. (Minimum 8 Required)
Note 1: Number of Survey Points shall be	Elevation (to ± 0.01)
Note 2: Layout of survey points shall be +/- 1 inch	Point No.
Note 3: f Out-of-Plane settlement (differential Settlement) is known or suspected, the spacing between perimeter points shall be half of the API 653 requirement, i.e. 16 feet spacing instead of the API 653 spacing of 32 feet maximum.	Elevation (to ± 0.01)
DESCRIPTION OF TANK MARKING (survey points):	1. _____ 21. _____
	2. _____ 22. _____
	3. _____ 23. _____
	4. _____ 24. _____
	5. _____ 25. _____
DESCRIPTION & LOCATION OF SITE BENCHMARK	6. _____ 26. _____
	7. _____ 27. _____
	8. _____ 28. _____
	9. _____ 29. _____
ELEVATION OF BENCHMARK (actual or assumed)	10. _____ 30. _____
	11. _____ 31. _____
SURVEY CLOSED TO ±.02 FEET (If not, the tank must be re-surveyed) <input type="checkbox"/> Yes <input type="checkbox"/> No	12. _____ 32. _____
DESCRIPTION OF SURVEY TECHNIQUES & ADDITIONAL COMMENTS	13. _____ 33. _____
	14. _____ 34. _____
	15. _____ 35. _____
	16. _____ 36. _____
	17. _____ 37. _____
	18. _____ 38. _____
	19. _____ 39. _____
	20. _____ 40. _____

# 18TS6S3 – External Inspection Checklist

**A. SUMMARY/OVERVIEW OF INSPECTION**  
(Note: Overview is the condition of the tank overall and may not be specific to any particular inspection item.)

Tank No. 6 was found in acceptable condition.

**B. REPAIR RECOMMENDATIONS - (PRIOR TO RETURN TO SERVICE)**

Tank is suitable for continued service       Yes, without repairs       Yes, with the following repairs:       No

Safe Fill Height values are shown at bottom of T-173

