ATMOSPHERIC STORAGE TANK

INTERNAL / EXTERNAL & ULTRASONIC

API 653 OUT-OF-SERVICE INSPECTION REPORT

SHELL PIPELINE

TANK NO. 5

SHELL PIPELINE FACILITY

SUGAR LAND, LA

JULY 31-AUGUST 10, 2007

Prepared by:

HMT Inspection
A Division of HMT Inc.
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INTRODUCTION

Shell Pipeline contracted with HMT Inspection, a division of HMT Inc., to provide inspection services for Tank No. 5. The tank is located at the Shell Pipeline Facility in Sugar Land, LA.

This report documents the findings of the examinations performed on July 31 – August 10, 2007 and provides an evaluation of the inspection results per the applicable criteria of API Standard 653.

The owner / user is responsible for establishing the suitability for service of Tank. 5 based on the applicable criteria of API 653. This report provides details on current condition from inspection that can be used as a basis in satisfying this requirement if the following conditions are met:

1. The recommendations in Section 2.0 Summary and Repair Recommendations of this report are reviewed, evaluated and implemented (or a decision is made by responsible owner / user representatives to take no further action) prior to return to service and documentation of actions taken (or not taken) is provided for in tank records.

2. The safe fill height recommendations in Section 2.0 Summary and Repair recommendations of this report are adhered to.

HMT Inspection provided the following personnel:

Ben Peska
API 653 Aboveground Storage Tank Inspector
Certification Number 6200

Freeman Hancock
Level II Technician

Seth Aguillard
Level I Technician

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1.0 DESCRIPTION

GENERAL:

TANK NUMBER:	5
OWNER:	Shell Pipeline
DESIGN STANDARD:	API 650, 6th Ed., Rev.0, w/Apps. D & K
TANK LOCATION:	St. James, Louisiana
MANUFACTURER:	Graver Tank & Manufacturing Co.
PRODUCT:	Crude Oil
DESIGN SPECIFIC GRAVITY:	1.0
DESIGN PRESSURE:	Atmospheric
CATHODIC PROTECTION:	Yes (Sacrificial Anodes)
DATA PLATE PRESENT:	Yes
DOT REGULATED TANK:	Yes

DIMENSIONS:

DIAMETER:	300.00 ft.
HEIGHT:	36.67 ft. (as measured)
CAPACITY GROSS:	464,058 bbls.
OPERATING HEIGHT:	33.36 ft.
CAPACITY NOMINAL:	418,707 bbls.

GEOMETRY:

FOUNDATION:	Concrete Ringwall
BOTTOM:	Lap Welded (Cone Up)
SHELL:	Butt Welded
FIXED ROOF:	N/A
FLOATING ROOF:	Lap Welded Annular Pontoon w/Barrel Pontoons
PRIMARY SEAL:	Mechanical Shoe
SECONDARY SEAL:	Cast (Flexible) Wiper

DATES:

YEAR BUILT:	1979
LAST COATED:	1999 (External) 1979 (Internal)
LAST INSPECTION:	2000 (External)

ACCESS:

STAIRWAY:	Spiral
FLOATING ROOF ACCESS:	Rolling Ladder

COATINGS:

BOTTOM:	Thin-Film Epoxy
SHELL:	External - White Paint Internal - Epoxy on Lower 24 Inches
FLOATING ROOF:	External - White Paint Internal - None

2.0 SUMMARY AND REPAIR RECOMMENDATIONS

The following is a summary of the significant findings of the inspection.

FOUNDATION: The survey found the tank to be out of level by 3.60 inches. API 653 calculation for deflection of this tank is 0.46 inch. API 653 maximum deflection permitted for this tank is calculated to be 1.84 inches (ref. API 653, Appendix B, Para. B.2.2.3). Differential settlement for this tank does not exceed the API allowable (ref. API 653, Appendix B, Para. B.2.2.3).

The moisture barrier was deteriorated. Consideration should be given to installing an appropriate moisture barrier to seal against water intrusion under the tank bottom.

The tank is resting on a concrete ringwall that has hairline cracks intermittently around the perimeter. These cracks should be sealed to minimize further degradation of the foundation from moisture penetration corroding the reinforcement or from freeze / thaw cycling further opening these cracks.

BOTTOM: Tank No. 5 was built by Graver Tank & Manufacturing Company in 1979 to API 650, 6th Ed., Rev. 0, with Appendices D and K. Nominal bottom plate thickness is 0.250 inch. Visual (VT) inspection, in conjunction with Magnetic Flux Leakage (MFL) scanning, revealed six (6) areas of product side corrosion pitting 0.080 inch deep or more. Three (3) areas of internal pitting were located within the critical zone. These areas of pitting should be repaired by installing tombstone-style lap welded patch plates (ref. API 653, Figure 9-5) using approved welding and safety procedures per API 653 guidelines prior to returning the tank to service. Vacuum Box (LT/BT) testing should be performed on the patch plate welds.

Visual (VT) inspection of any of the internal welds was limited due to the presence of coating. The coating was applied too heavily around the bottom-to-shell weld, resulting in cracking of the coating. Product side corrosion was located in these areas. The internal coating will be properly removed at the bottom-to-shell weld and lap welds to allow for additional inspection (per client).

Inspection found numerous stringer / weld beads that should be ground down smooth to the surface prior to recoating the bottom.

Inspection found no bearing plates beneath the internal drain piping supports. Consideration should be given to installing bearing plates beneath these items by seal welding to the bottom using appropriate welding and NDE procedures per API 653 guidelines. Bearing plates, while not required, provide additional thickness in areas inaccessible to inspection equipment.

BOTTOM (CONT'D.): The floating roof striker plates were found to have corrosion. One (1) striker plate has a through-thickness hole. Consideration should be given to replacing all the striker plates using appropriate welding and NDE procedures per API 653 guidelines.

The mechanical pop-up vent legs do not have striker plates underneath. Consideration should be given to installing striker plates beneath these items by seal welding to the bottom using appropriate welding and NDE procedures per API 653 guidelines. Striker plates, while not required, provide additional thickness in areas inaccessible to inspection equipment.

The next internal inspection should be conducted within 12 years if all areas of internal corrosion with a pit depth of 0.070 inch or greater are repaired. If all such areas are repaired and the bottom is properly re-coated, the next inspection should be conducted within 20 years (ref. API 653, Para. 4.4.7).

SHELL: Shell thickness calculations indicate the safe fill height of 36.67 feet can be utilized with product specific gravities up to 0.82. The safe fill height, or storage of product with specific gravities between 0.82 and 1.0, should be restricted to between 36.67 feet and 31.62 feet, respectively (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. There are no shell-mounted overflow vents on this tank.

One (1) external plate defect was noted in shell Course 2 at Station 579.0 (measured in feet counterclockwise from Manway A). This area should be monitored.

Inspection noted porosity in the external bottom-to-shell weld around the perimeter of the tank from Stations 495.0 to 579.0 (measured in feet counterclockwise from Manway A). These areas were covered by grade and could not be inspected and should be further cleaned and repaired as necessary using appropriate welding and NDE procedures per API 653 guidelines.

The automatic gauge, wind girder, stairway, and firewater piping supports do not have reinforcing plates. Visual (VT) inspection of these supports found them to be in acceptable condition. This is provided as information only and no corrective action is required at this time. Consideration should be given to installing seal welded reinforcing plates under each support the next time major repairs are made to the shell or when a hydrostatic test is required for other reasons.

The next external API 653 inspection should be conducted within 5 years and no later than July 2012 (ref. API 653, Para. 6.3.2.1).

NOZZLES AND APPURTENANCES: The automatic gauge and high-level alarm systems should be tested, repaired if necessary, and calibrated prior to returning the tank to service.

Nozzles I, N, S, U and Z have weld spacing between their reinforcing plates and the shell-to-bottom joint less than that required by API 650, Para. 3.7.3. Such practice results in areas of increased stress concentration and possible accelerated corrosion. Visual (VT) inspection of these nozzles did not identify any such corrosion at this time. No corrective action is required. Consideration should be given to raising these nozzles in accordance with API 650 the next time this tank has major repairs to the shell or when a hydrostatic test is required for other reasons.

The automatic gauge and high-level alarm systems should be tested, repaired if necessary, and calibrated prior to returning the tank to service.

The firewater system is not connected and is no longer in use.

FLOATING ROOF: Inspection noted scattered areas of coating failure on the floating roof deck. Consideration should be given to properly cleaning, repairing and re-coating the affected areas. One Belzona patch was noted on Plate 3 that should be repaired using appropriate welding and NDE procedures per API 653 guidelines.

The floating roof pontoon deck has severe corrosion areas where the top pontoon plates are holding water. Consideration should be given to repairing the deck plates using appropriate welding and NDE procedures per API 653 guidelines.

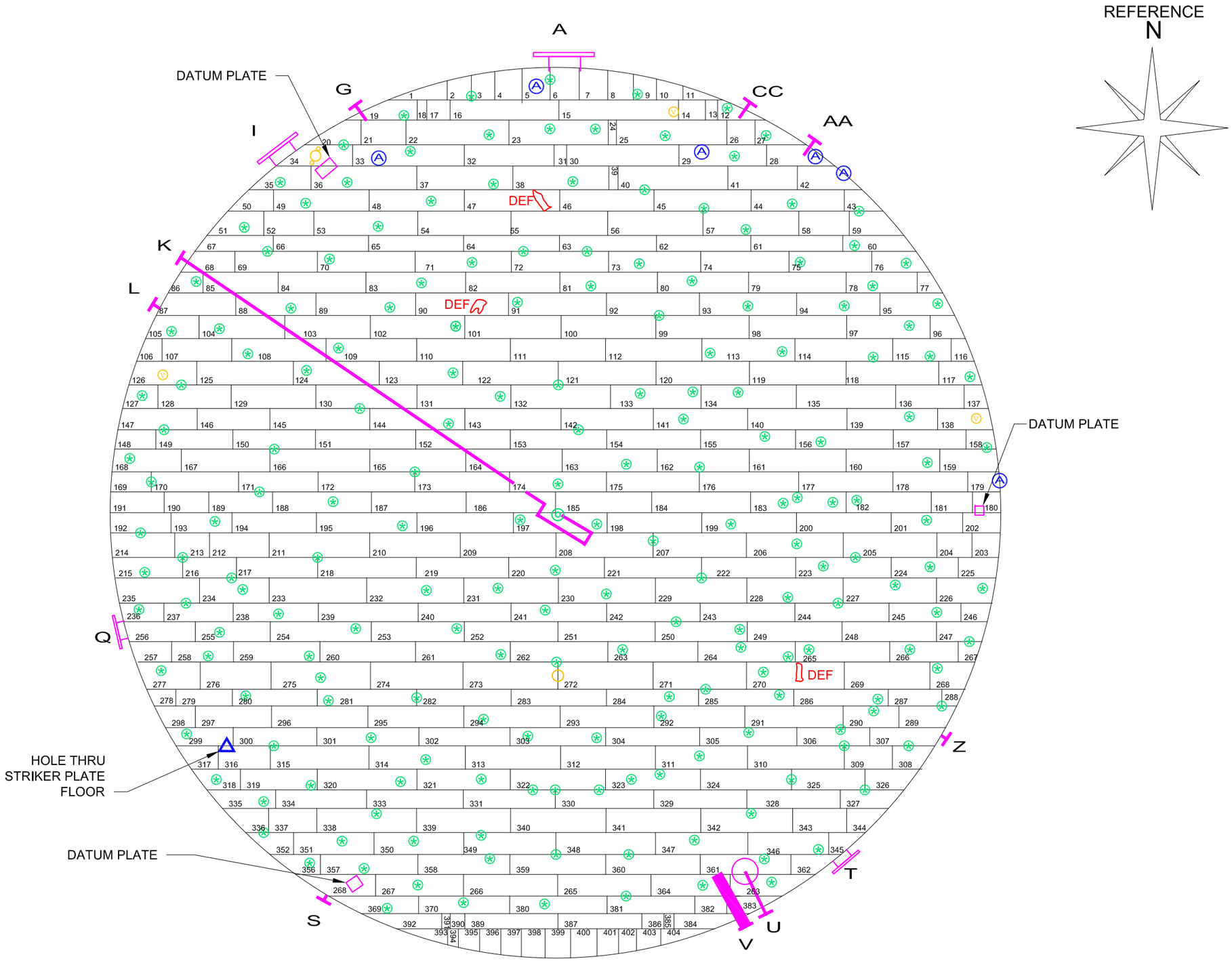
Annular Pontoons 11, 25, 27, 29, 30, 31, 32, 33 and 34 show evidence of water inside. The majority of these pontoon plates are to be replaced due to severe corrosion (per client). The barrel pontoons were pressure tested and were in acceptable condition. There is corrosion around the bottom-to-deck plate connections at these pontoons. The pontoons should be further checked after the areas are properly cleaned.

The nozzles and appurtenances were rusting and corroding. The nozzles and seals should be cleaned and the seals replaced prior to placing the tank back in service.

The primary seal is a mechanical shoe. Inspection noted the seal to be worn and deteriorated. The shoe is galvanized and will be replaced (per client).

The secondary seal is a cast (flexible) wiper. Inspection noted the seal to be worn, cracked and deteriorated. The compression plates were broken at the attachment ring. The compression plates are galvanized and will be replaced (per client).

All floating roof legs and sleeves are to be replaced (per client).



DRAWING NOT TO SCALE

NOZZLES

A = 48" CLEANOUT
G = 4" NOZZLE
I = 30" MANWAY
K = 6" NOZZLE
L = 6" NOZZLE
Q = 6" NOZZLE
S = 28" MANWAY
V = 4" NOZZLE
U = 12" NOZZLE
T = 36" NOZZLE
Z = 24" MANWAY
AA = 6" NOZZLE
CC = 24" MANWAY

CP : PRESENT
CP TYPE : SACRIFICIAL ANODES
COATING : THIN - FILM EPOXY

GENERAL

RECORDING CRITERIA: 0.170"
12 YRS. AFTER REPAIR
WITH THIN FILM COATING: 20 YRS.
AFTER REPAIR

PROGRAM NAME : AUTO CAD LT.
LAYER NOZZLES = NOZZLES
LAYER INDICATIONS = INDICATIONS

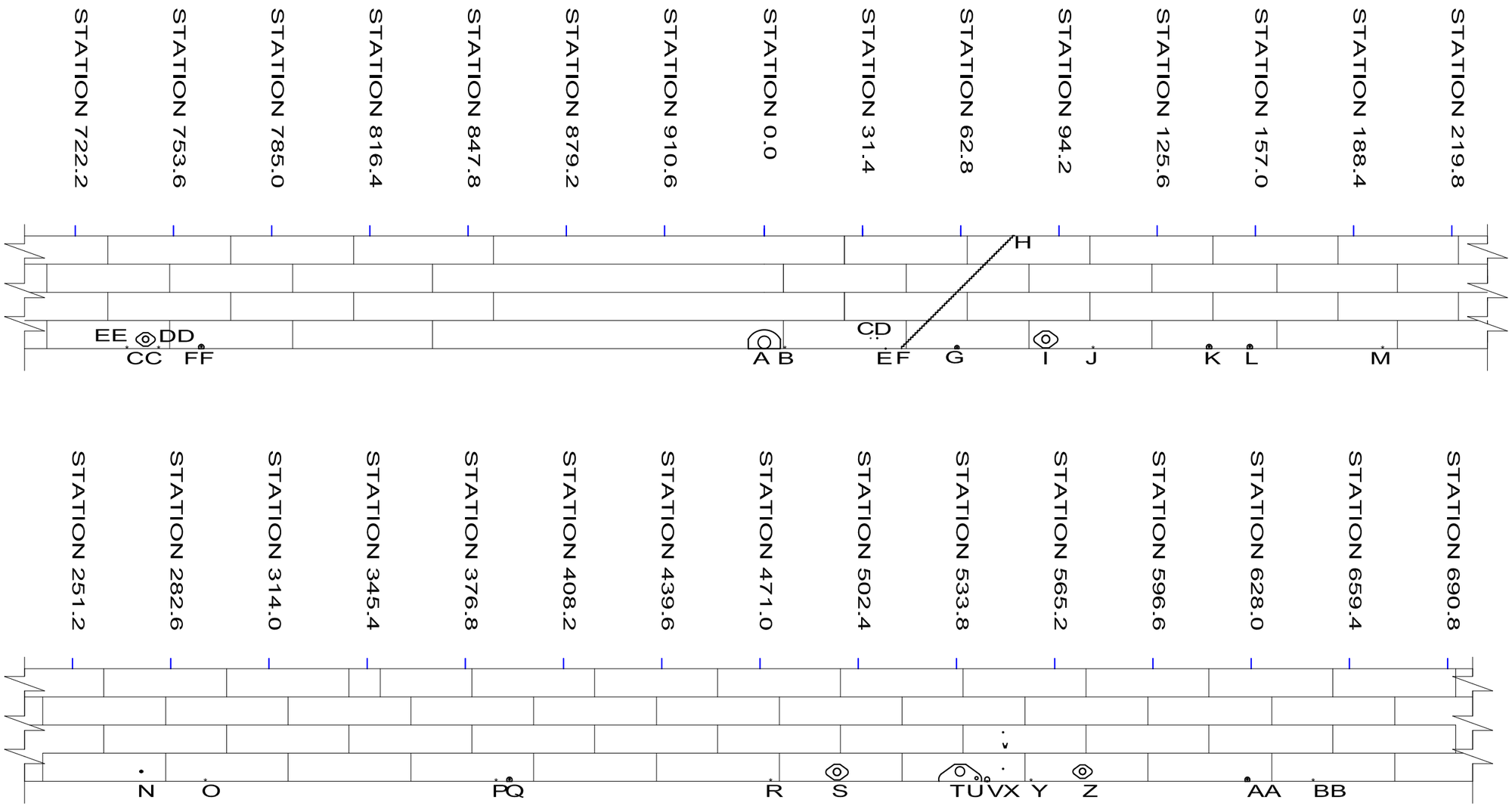
HOLE
TOP SIDE INDICATIONS
SOIL SIDE INDICATIONS
TOP SIDE / SOIL SIDE INDICATION
TOP SIDE/ SOIL SIDE / HOLE INDICATION
REFERENCE CORNER

LEGEND

= GAUGE POLE
= AUTO GAUGE
= PATCH PLATE
= ANTI ROTATION
= VACUUM BREAKER
= FLOATING ROOF LEG
= ROOF SUPPORT COLUMN

INSPECTION
8979 MARKET STREET ROAD
HOUSTON, TEXAS 77029

TITLE: BOTTOM LAYOUT	
CUSTOMER: SHELL PIPELINE	
TANK NO: 5	JOB NO: 40512
DRAWN BY: C.E.	DATE: 5 SEPT. 2007



DRAWING NOT TO SCALE

GENERAL

1. DESIGN STANDARD : API 650
2. MANUFACTURER : GAVER TANK & MANUFACTURER CO.
3. PRODUCT : CRUDE OIL
4. DATA PLATE : YES
5. DIAMETER : 300.00'
6. HEIGHT : 36.67'
7. JOINT EFFICIENCY: .85
8. BUTT WELDED
9. COURSES : 4
10. YR. BUILT : 1979
11. STAIRWAY : SPIRAL
12. COATING : EXTERNAL WHITE PAINT

NDA = NO DATA AVAILABLE

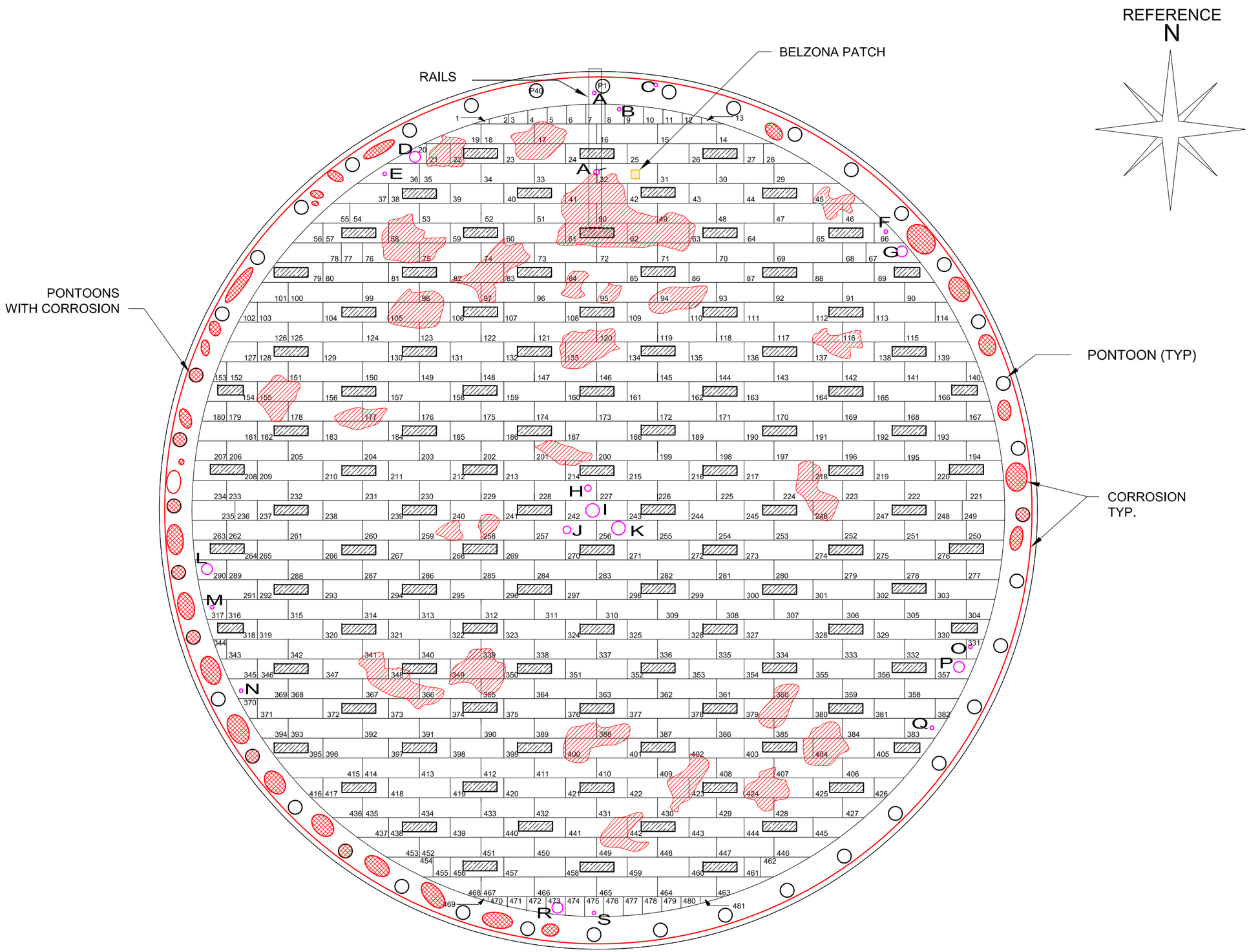
COURSE	AVERAGE THICKNESS	HEIGHT (INCH)
1	1.088"	110"
2	0.797"	110"
3	0.507"	110"
4	0.427"	110"

LEGEND

REFERENCE NOZZLE AND APPURTENANCE TABLE FOR ITEM IDENTIFICATION

INSPECTION
8979 MARKET STREET ROAD
HOUSTON, TEXAS 77029

TITLE: SHELL LAYOUT	
CUSTOMER: SHELL PIPELINE	
TANK NO: 5	JOB NO: 40512
DRAWN BY: C.E.	DATE: 6 SEPT. 2007



DRAWING NOT TO SCALE

NOZZLES

A = 8" NOZZLE
B = 30" MANWAY
C = 16" SUMP
D = 10" NOZZLE
E = 10" NOZZLE
F = 24" MANWAY
G = 6" NOZZLE
H = 30" CENTER SUMP DRAIN
I = 30" MANWAY
J = 6" NOZZLE
K = 24" MANWAY
L = 10" NOZZLE
M = 10" NOZZLE
N = 24" MANWAY
O = 8" NOZZLE
P = 8" NOZZLE
Q = 24" MANWAY
R = 10" NOZZLE

COATING : EXTERNAL-WHITE PAINT

GENERAL

NOMINAL THICKNESS : 0.187"
AVG. UT THICKNESS : 0.191"
MIN. UT THICKNESS : 0.179"

LEGEND

= GAUGE POLE
= AUTO GAUGE
= PATCH PLATE
= ANTI ROTATION
= VACUUM BREAKER
= FLOATING ROOF LEG
= ROOF SUPPORT COLUMN
= BARREL PONTOONS
= CORROSION
= LOW SPOTS

INSPECTION
8979 MARKET STREET ROAD
HOUSTON, TX 77029

TITLE: FLOATING ROOF LAYOUT

CUSTOMER: SHELL PIPELINE

TANK NO:	JOB NO:
5	40512
DRAWN BY: C.E.	DATE: 6 SEPT. 2007

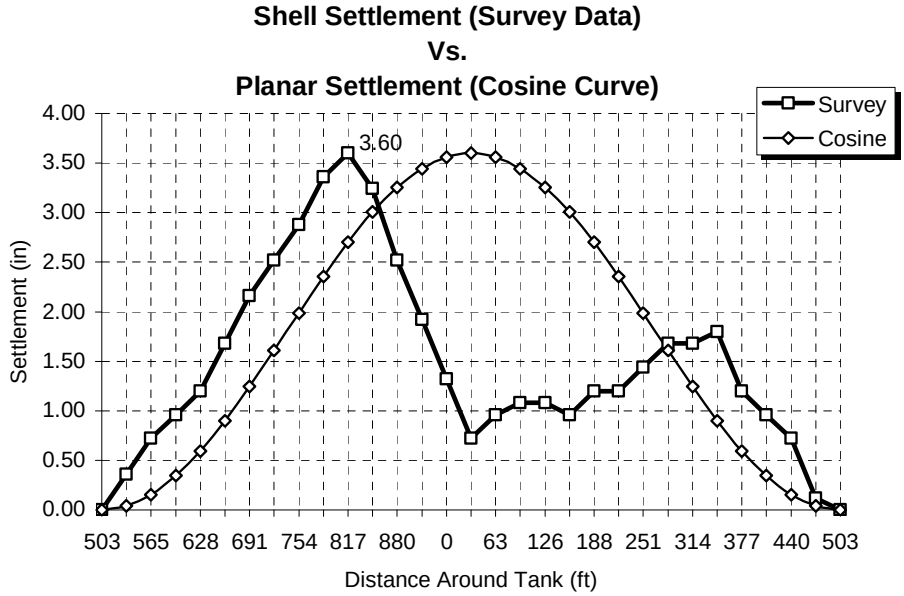
4.0 INSPECTION REPORT

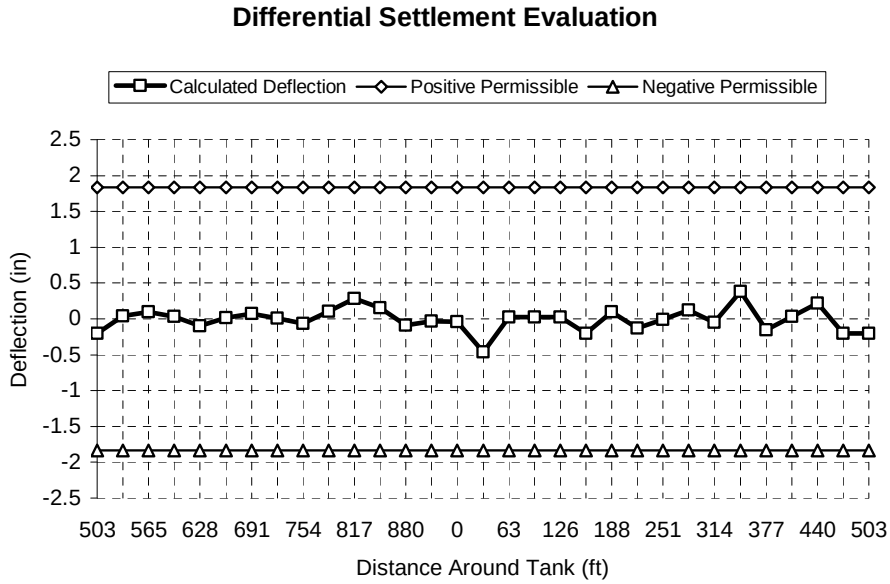
4.1 FOUNDATION

4.1.1 FOUNDATION INSPECTION CHECKLIST

✓	#	DESCRIPTION	COMMENTS
Y	1	Inspect foundation for damage.	Reference Section 2.0
Y	2	Search for indications of bottom leakage.	None found
Y	3	Inspect for cavities and vegetation under foundation.	Acceptable
Y	4	Check for proper water runoff and drainage away from the tank.	Acceptable
Y	5	Check for grade or other material covering the shell-to-bottom junction. Detail findings.	Acceptable
Y	6	Check for settlement around the perimeter of the tank.	Reference Sections 2.0 and 4.1.2.
Y	7	Check for presence or condition of moisture barrier.	Reference Sections 2.0
N	8	Check for anchorage. Record sizes, spacing between anchors and condition.	N/A

4.1.3 FOUNDATION SETTLEMENT EVALUATION





4.1.2 FOUNDATION SETTLEMENT SURVEY

The survey was conducted counterclockwise from the reference Shell Manway A located at Station 0.0. The circumferential distance between the readings is 31.42 feet. The survey found the tank to be out of level by 3.60 inches.

Point No.	Distance from Shell (ft.)															
	Shell	10’	20’	30’	40’	50’	60’	70’	80’	90’	100’	110’	120’	130’	140’	Center
	Rod Readings (ft.)															
1	5.33	5.21	4.97	4.88	4.72	4.57	4.35	4.19	3.95	3.72	3.65	3.36	3.17	2.93	2.90	2.79
2	5.28	5.27	5.02	4.91	4.68	4.55	4.50	4.26	4.02	3.85	3.68	3.50	3.31	3.10	2.92	--
3	5.30	5.22	5.13	4.98	4.85	4.64	4.50	4.27	3.97	3.87	3.66	3.54	3.35	3.09	2.94	--
4	5.31	5.23	5.10	4.99	4.80	4.60	4.50	4.20	3.99	3.80	3.56	3.46	3.40	3.09	3.00	--
5	5.31	5.25	5.02	5.00	4.76	4.71	4.47	4.19	3.96	3.71	3.60	3.50	3.30	3.03	3.06	--
6	5.30	5.20	4.96	4.97	4.76	4.56	4.45	4.11	4.00	3.76	3.65	3.47	3.29	3.10	2.94	--
7	5.32	5.26	5.03	5.01	4.80	4.61	4.61	4.20	4.10	3.81	3.59	5.60	3.36	3.11	3.00	--
8	5.32	5.28	4.97	5.06	4.71	4.46	4.50	4.30	4.11	3.90	3.71	3.51	3.31	2.96	3.04	--
9	5.34	5.30	5.00	5.03	4.67	4.60	4.55	4.31	4.06	3.88	3.70	3.56	3.32	2.97	2.99	--
10	5.36	5.21	4.96	4.99	4.80	4.69	4.47	4.28	3.96	3.81	3.67	3.46	3.41	3.00	2.92	--
11	5.36	5.24	4.98	4.88	4.69	4.61	4.49	4.18	3.99	3.86	3.61	3.45	3.39	3.10	2.91	--
12	5.37	5.29	5.03	4.87	4.76	4.51	4.41	4.21	3.96	3.71	3.65	3.41	3.36	3.11	2.96	--
13	5.32	5.28	5.15	4.90	4.73	4.50	4.53	4.21	3.90	3.71	3.57	3.39	3.50	3.13	3.00	--
14	5.30	5.31	5.10	4.91	4.79	4.66	4.47	4.26	3.90	3.80	3.65	3.47	3.50	3.13	2.94	--
15	5.28	5.28	5.11	4.96	4.81	4.63	4.50	4.27	3.96	3.76	3.61	3.53	3.49	3.09	3.01	--
16	5.23	5.34	5.05	4.98	4.85	4.70	4.49	4.31	4.00	3.71	3.79	3.51	3.40	3.01	2.90	--
17	5.22	5.30	5.06	5.01	4.91	4.55	4.53	4.36	4.06	3.86	3.80	3.48	3.39	3.01	2.91	--
18	5.25	5.27	5.03	4.99	4.81	4.57	4.57	4.31	4.11	3.80	3.75	3.40	3.36	2.99	2.96	--
19	5.28	5.23	5.15	5.00	4.81	4.69	4.47	4.27	4.13	3.88	3.71	3.57	3.40	2.96	3.00	--
20	5.30	5.22	5.09	4.96	4.86	4.65	4.48	4.27	4.00	3.88	3.75	3.61	3.41	2.93	2.99	--
21	5.32	5.25	5.07	5.10	4.80	4.65	4.41	4.30	3.98	3.82	3.61	3.57	3.36	2.90	3.02	--
22	5.36	5.28	5.01	4.98	4.77	4.61	4.44	4.20	4.05	3.86	3.62	3.41	3.39	3.06	3.06	--
23	5.40	5.27	5.02	4.99	4.81	4.71	4.48	4.10	4.10	3.77	3.63	3.43	3.33	3.10	3.03	--
24	5.43	5.22	5.07	5.01	4.81	4.71	4.50	4.12	4.00	3.75	3.70	3.39	3.30	2.94	2.93	--
25	5.46	5.23	5.10	5.03	4.83	4.59	4.47	4.50	3.96	3.61	3.69	3.57	3.36	2.99	2.96	--

26	5.50	5.26	5.12	5.06	4.84	4.51	4.53	4.27	4.11	3.68	3.60	3.40	3.30	2.98	2.97	--
27	5.52	5.30	5.15	5.01	4.88	4.60	4.51	4.24	4.12	3.70	3.49	3.40	3.23	3.10	3.02	--
28	5.49	5.26	5.21	4.99	4.96	4.59	4.60	4.20	4.00	3.77	3.50	3.46	3.20	3.10	3.01	--
29	5.43	5.28	5.20	5.03	4.91	4.65	4.50	4.27	3.96	3.70	3.60	3.40	3.10	3.00	2.93	--
30	5.38	5.29	5.19	4.98	4.80	4.55	4.36	4.19	3.96	3.68	3.65	3.30	3.11	2.93	2.93	--

4.2 BOTTOM

4.2.1 BOTTOM INSPECTION CHECKLIST

✓	#	DESCRIPTION	COMMENTS
Y	1	Conduct Visual Inspection of bottom/ bottom coating. Record all findings.	Reference Section 2.0
N	2	Conduct Vacuum Box Bubble Test Inspection of lap welds and internal shell-to-bottom weld. Record all findings.	NA
N	3	Conduct Magnetic Particle Inspection of the internal shell-to-bottom weld. Record all findings.	NA
Y	4	Conduct Visual Inspection on bottom lap and shell-to-bottom weld. Record all finding	Reference Sections 2.0 and 5.0
Y	5	Conduct Ultrasonic Thickness readings of bottom plates. Record all data.	Reference Section 5.0
Y	6	Conduct Magnetic Flux Leakage Inspection of bottom. Quantify all findings.	Reference Sections 2.0 and 5.0
Y	7	Locate unacceptable voids beneath bottom. Record the locations.	Acceptable
Y	8	Conduct Visual Inspection of reinforcement.	Reference Section 2.0
Y	9	Conduct Visual Inspection of fixed roof support column, base plates and lateral clips.	Reference Section 2.0
Y	10	Conduct Visual Inspection of sump(s), sump welds and condition of sump coating. Record all findings.	Acceptable
Y	11	Conduct Ultrasonic Thickness readings of sump(s). Record all data. Perform additional NDE if necessary.	Reference Section 5.0

4.2.2 SERVICE INTERVAL

The next internal inspection should be conducted within 12 years if all areas of soil side corrosion resulting in a remaining thickness of 0.170 inch or below are repaired and all areas of internal corrosion with a pit depth of 0.080 inch or greater are repaired. If all such areas are repaired and the bottom is internally coated, the next inspection should be conducted within 20 years, provided that the expected life of the coating meets or exceeds this interval (ref. API 653, Para. 4.4.7).

The next external API 653 inspection should be conducted within 5 years and no later than July 2012 (Ref. API 653, Para. 6.3.2.1).

Nominal Bottom Plate Thickness (inches)	0.250	inch
Maximum Underside Corrosion Depth	0.020	inch
Maximum Internal Corrosion Depth	0.200	inch
Minimum Remaining Thickness at Next Inspection (MRT)	0.100	inch
Year of Inspection (Yi)	2007	year
Year of Construction (Yo)	1979	year
Minimum Remaining Thickness from Underside Corrosion after Repairs (RTbc)	0.170	inch
Minimum Remaining Thickness from Internal Corrosion after Repairs (RTip)	0.170	inch
Underside Corrosion Rate (UPr)	0.0029	inch/yr
Internal Corrosion Rate (StPr)	0.0029	inch/yr

Repaired Underside Corrosion Evaluation (assume 0.25 patch): 0.250 in Patch Plate **Acceptable**
(per API 653 4.4.7.1, UPr Def.)

$$O_r = \frac{(\min RT_{bc} or RT_{ip}) - MRT}{S_t P_r + UP_r}$$

Interval to next inspection **12 Years**
(RRT-0.10)/(Int+US C.R.)

If a thin film coating is installed after repairs
(expected life of coating must equal or exceed this interval) ***20*** **Years**
(Internal Corrosion Rate = 0) (RRT-0.10)/(0 + US C.R.)

4.3 SHELL

4.3.1 SHELL INSPECTION CHECKLIST

✓	#	DESCRIPTION	COMMENTS
Y	1	Inspect external shell for coating failure, corrosion or leaks.	Reference Section 2.0
Y	2	Inspect external shell-to-bottom weld area for corrosion, defects, or thinning on weld, shell, or bottom.	Reference Section 2.0
Y	3	Inspect internal shell surface for corrosion or leaks.	None found
Y	4	Inspect weld seams for corrosion or defects Visually inspect rivet joint details and record findings.	Joint Efficiency = 0.85 Butt Welded, Acceptable
Y	5	Inspect wind girder for corrosion or damage.	Acceptable
Y	6	Check support welds to shell for corrosion or defects.	Acceptable
Y	7	Note whether supports have reinforcing pads welded to shell.	Reference Section 2.0
N	8	Conduct Visual Inspection of shell insulation inspect for damage.	NA
Y	9	Visually inspect shell for out-of-roundness	Acceptable
N	10	Shell mounted vents, Check for debris covering or condition of screens.	N/A

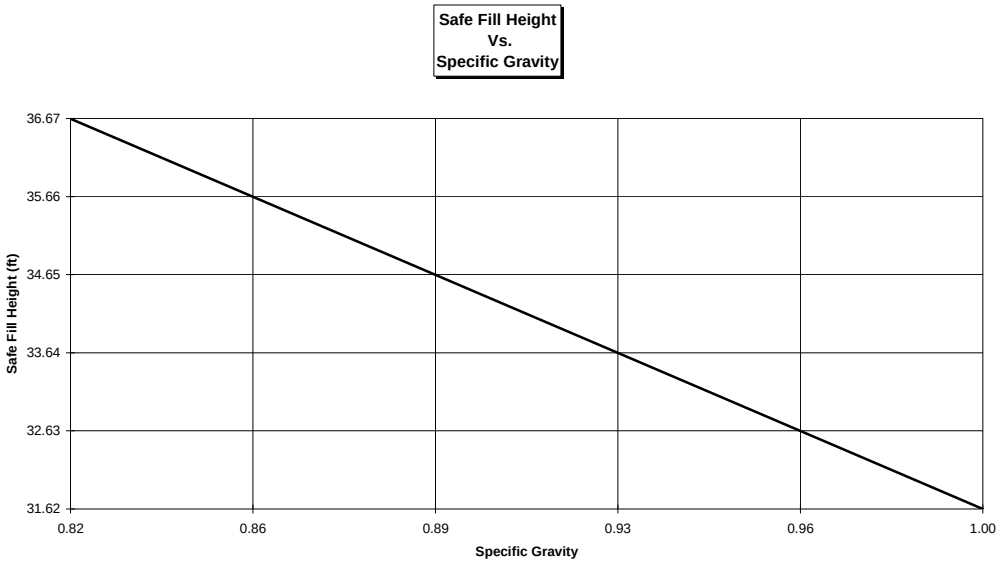
4.3.2 SHELL THICKNESS CALCULATIONS

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

Where:

S =	See Table	=	Allowable Stress (psi)
D =	300.00	=	Nominal Diameter of Tank (ft.)
G =	0.82	=	Highest Specific Gravity of Contents
H =	See Table	=	Product Height (ft.)
E =	See Table	=	Joint Efficiency

Course	Course Height (in.)	Product Height (ft.)	Allowable Stress (psi)	Joint Efficiency	Average Thickness (in.)	Required Thickness (in.)
1	110	36.67	23,600	0.85	1.088	1.069
2	110	27.50	23,600	0.85	0.797	0.797
3	110	18.33	26,000	0.85	0.507	0.448
4	110	9.17	26,000	0.85	0.427	0.209



4.4 NOZZLES AND APPURTENANCES

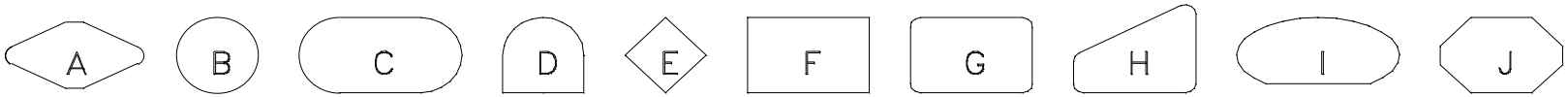
4.4.1 NOZZLE AND APPURTENANCE INSPECTION CHECKLIST

✓	#	DESCRIPTION	COMMENTS
Y	1	Inspect for signs of corrosion or other defects around all manways, nozzles, and attachments.	Reference Section 2.0
Y	2	Inspect for flange leaks and leaks around bolts.	None found
Y	3	Check piping and valves for leaks, thermal relief or signs of damage.	Reference Section 2.0
Y	4	Inspect condition of stairway ladder and platform.	Acceptable
N	5	Check welds on shell mounted davit clips above large valves or equipment.	N/A
Y	6	Describe and verify operability of gauging devices, if applicable.	Type: VAREC Reference Section 2.0
Y	7	Inspect mixer for support, leakage, and defects.	Acceptable
Y	8	Check for adequate reinforcement around nozzles and appurtenances.	Acceptable
Y	9	Verify adequate weld spacing around nozzles and appurtenances.	Reference Section 2.0
N	10	Check floating suction for damage and proper support. Check condition of shell mounted angle limiting brackets or angle limiting chains mounted to bottom	NA

Item	Description	Pipe Size (in.)	Station (ft.)	CL Elev. (in.)	Reinforcing Plate Width (in.)	Height (in.)	Thick (in.)	Shape	Neck Thick (in.)	Flng Thick (in.)	Cover Thick (in.)	Tell-tale	Weld Space (in.)	Comments
A	Cleanout	48 x 48	0.0	24	123	72	1.293	D	1.276	1.007	1.015	Y	0	
B	Grounding Lug	---	6.6	---	---	---	---	---	---	---	---	---	---	
C	Nozzle	2	34	40	---	---	---	---	0.262	0.782	0.825	---	39	Temp Gauge
D	Nozzle	1	36.1	40	---	---	---	---	0.237	0.754	0.772	---	39	
E	Automatic Gauge	---	38.8	---	---	---	---	---	---	---	---	---	---	
F	Stairway	---	43.9	---	---	---	---	---	---	---	---	---	---	Bottom
G	Nozzle	4	61.6	5	16	12	1.087	D	0.393	0.585	---	Y	0	
H	Stairway	---	78	---	---	---	---	---	---	---	---	---	---	Top
I	Manway	30	90	36	72	72	---	A	---	---	---	---	4	Mixer, IWS
J	Grounding Lug	---	105.2	---	---	---	---	---	---	---	---	---	---	
K	Nozzle	6	142.2	8	20	16	1.102	D	0.457	0.970	---	Y	0	Roof Drain
L	Nozzle	6	155.2	8	20	16	1.092	D	0.472	1.091	1.294	Y	0	
M	Grounding Lug	---	197.6	---	---	---	---	---	---	---	---	---	---	
N	Manway	24	273.2	38	74	68	1.115	A	1.130	0.557	---	Y	6	IWS
O	CP Grounding Lug	---	293.7	---	---	---	---	---	---	---	---	---	---	
P	Grounding Lug	---	386.7	---	---	---	---	---	---	---	---	---	---	
Q	Nozzle	6	390.9	8	20	16	1.170	D	0.465	1.053	1.163	Y	0	
R	CP Grounding Lug	---	474.3	---	---	---	---	---	---	---	---	---	---	
S	Manway	28	495.6	36	80	60	1.109	A	1.116	0.554	---	Y	6	Mixer, IWS
T	Nozzle	36	534.9	38	64	72	1.230	D	0.675	2.501	---	Y	0	Share Re-pad U
U	Nozzle	12	540.2	12	64	72	1.230	D	0.532	1.261	---	Y	0	Share Re-pad T
V	Nozzle	4	543.6	---	18	---	1.065	D	0.405	0.975	---	Y	6	IWS
W	Nozzle	2	548.7	135	---	---	---	---	---	---	---	---	---	Course 2
X	Nozzle	2	548.7	48	---	---	---	---	0.282	0.806	---	---	46.25	
Y	CP Grounding Lug	---	557.7	---	---	---	---	---	---	---	---	---	---	
Z	Manway	24	574.1	38	74	68	1.129	A	1.140	0.642	---	Y	6	Mixer, IWS

The stations are measured circumferentially counterclockwise from Manway A.

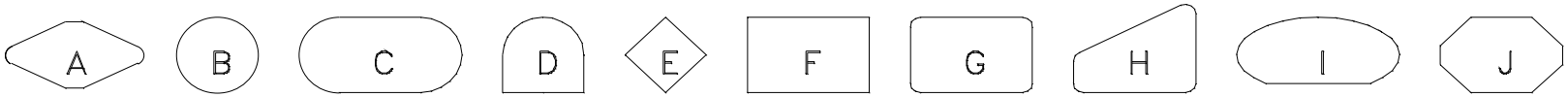
Shape



Item	Description	Pipe Size (in.)	Station (ft.)	CL Elev. (in.)	Reinforcing Plate Width (in.)	Height (in.)	Thick (in.)	Shape	Neck Thick (in.)	Flng Thick (in.)	Cover Thick (in.)	Tell-tale	Weld Space (in.)	Comments
AA	Nozzle	6	626.8	8	18	16	1.119	D	0.504	1.097	1.113	Y	0	
BB	Grounding Lug	---	647.8	---	---	---	---	---	---	---	---	---	---	
CC	Manway	24	744.7	36	60	50	1.118	A	1.142	0.561	0.561	Y	12	
DD	CP Grounding Lug	---	748.8	---	---	---	---	---	---	---	---	---	---	
EE	CP Grounding Lug	---	738.6	---	---	---	---	---	---	---	---	---	---	
FF	Nozzle	6	762.5	8	20	16	1.121	D	0.460	1.125	1.125	Y	0	
GG	Manway	24	802.4	36	60	50	1.123	D	1.132	0.587	---	Y	12	
---	Total Circumference	---	942.5	---	---	---	---	---	---	---	---	---	---	

The stations are measured circumferentially counterclockwise from Manway A.

Shape



IWS = Inadequate weld spacing

*Reference photos due to unusual shape

VERTICAL WELD SEAM LOCATIONS: (Measured in feet circumferentially counterclockwise from Manway A)

1) 6.1	2) 45.4	3) 84.6	4) 123.9	5) 163.2	6) 202.4	7) 241.7	8) 281	9) 320.1	10) 330.1	11) 359.6
12) 398.6	13) 437.9	14) 477.2	15) 516.4	16) 555.7	17) 595	18) 634.6	19) 673.9	20) 713.1	21) 752.4	22) 791.7
23) 730.9	24) 770.2	25) 809.5	26) 836.4							

VERTICAL WELD OFFSET FOR COURSES 2, 3, 4, etc.

2) 25.6	3) 6.1	4) 25.6					

4.5 FLOATING ROOF

4.5.1 FLOATING ROOF INSPECTION CHECKLIST

✓	#	DESCRIPTION	COMMENTS
Y	1	Describe condition of floating roof.	Reference Section 2.0
Y	2	Conduct Visual Inspection of floating roof plates and welds or aluminum sheeting and structure.	Reference Section 2.0
Y	3	Describe condition of primary and secondary seals.	Primary: Mechanical Shoe Reference Section 2.0 Secondary: Cast Flexible Wiper Reference Section 2.0
Y	4	Conduct Visual Inspection of bolts and fasteners, with special attention to product interface areas.	References Section 2.0
Y	5	Measure seal gaps at regular intervals and record any visible seal damage.	Reference Section 2.0
Y	6	Inspect roof support legs, sleeves, and pins.	# of legs 196 Adjustable Leg Size 3.50 in. Sleeve Size 4 in. Reference Section 2.0
Y	7	Describe type and inspect roof drain system.	Type: Center Sump Reference Section 2.0
Y	8	Inspect pontoons for water, product, residue, and vapors. Check for presence of lock-down attachments on pontoon covers.	Reference Section 2.0
Y	9	Inspect Rolling or vertical ladder assembly.	Acceptable
Y	10	Inspect floating roof nozzles and appurtenances. Locate on layout.	Reference Section 2.0
Y	11	Inspect vacuum breaker, rim vent, gauge hatch, etc…. Record size and locate on layout.	Reference Section 2.0

4.5.2 FLOATING ROOF NOZZLE TABLE

Item	Description	Pipe Size (in.)	Location Plate No.	Neck Thick (in.)	Comments
A	Nozzle	8”	8	0.380	Gauge Hatch
B	Manway	30”	20	0.330	
C	Sump	16”	--	--	
D	Nozzle	10”	--	0.345	Vacuum Breaker
E	Nozzle	10”	--	0.346	Vacuum Breaker
F	Manway	24”	--	0.304	
G	Nozzle	6”	--	0.337	Gauge Hatch
H	Center Sump Drain	--	--	--	
I	Manway	30”	--	0.283	Center Manway
J	Nozzle	6”	--	0.341	Gauge Hatch
K	Manway	24”	--	0.287	w/Gauge Hatch on Cover
L	Nozzle	10”	--	0.345	Vacuum Breaker
M	Nozzle	10”	--	0.349	Vacuum Breaker
N	Manway	24”	--	0.300	
O	Nozzle	8”	--	0.368	Gauge Hatch
P	Nozzle	8”	--	0.370	Gauge Hatch
Q	Manway	24”	--	0.305	
R	Nozzle	10”	--	0.360	Vacuum Breaker

5.0 NDE INSPECTION

5.1 NDE INSPECTION SCOPE

The following Nondestructive Examinations (NDE) were conducted to evaluate the physical characteristics of the tank:

A) Magnetic Flux Leakage (MFL) scanning of the bottom for the detection of significant internal or soil side metal loss. Performed in accordance with HMT Inspection MFL Procedure No. 1611.4, Revision No. 6.

B) Quantitative remaining thickness measurements in any area of significant metal loss. Performed in accordance with HMT Inspection UT Procedure No. 1611.1, Revision No. 4.

C) Visual (VT) inspection of areas restricted from MFL coverage for the detection of anomalies or significant internal metal loss which may affect the integrity. Performed in accordance with HMT Inspection VT Procedure No. 1611.9, Revision No. 2.

D) Random Ultrasonic (UT) sump plate readings. Performed in accordance with HMT UT Procedure No. 1611.1, Revision No. 4.

E) Random Ultrasonic (UT) readings on shell / floating roof plates. Performed in accordance with HMT Inspection UT Procedure No. 1611.1, Revision No. 4.

F) Random Ultrasonic (UT) readings on shell / floating roof nozzles. Performed in accordance with HMT Inspection UT Procedure No. 1611.1, Revision No. 4.

5.2 SIGNIFICANT FINDINGS

MFL scanning revealed six (6) areas of significant metal loss. The lowest remaining thickness resolved was 0.050 inch, located on Plate 42, Indication A (ref. Table A).

5.3 BOTTOM EXAMINATION

Bottom plates were examined utilizing MFL, UT and VT inspection methods. The bottom was examined for the detection of both internal and soil side metal loss. Areas identified by the MFL as exceeding or closely approaching the critical thickness were quantified by UT and pit gauge measurements. Recording criteria was set by the client at 0.170 inch or less remaining thickness (ref. Table A). Nominal bottom plate thickness is 0.250 inch.

Areas of restricted access to MFL examination coverage included near the shell-to-bottom weld, plate-to-plate lap welds, fixed and floating roof supports, near the sump, gauge pole and under internal piping.

The bottom lap welds were examined utilizing VT inspection method.

The internal / external shell-to-bottom weld was examined utilizing VT inspection method.

5.4 SHELL READINGS

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

5.5 NOZZLE READINGS

The tank shell and floating roof nozzle UT data was collected utilizing random readings. One (1) reading per nozzle was taken (ref. Sections 4.4.2 and 4.5.2).

5.6 FLOATING ROOF READINGS

The floating roof deck plate UT data was collected utilizing random readings Three (3) readings per plate were taken (ref. Table C).

5.7 SUMP READINGS

The sumps were examined utilizing random readings. Sixteen (16) readings were taken along the wall, and ten (10) readings were taken across the bottom in an X pattern (Ref. Table D). There were no readings that deviated significantly from nominal thickness.

6.0 EQUIPMENT

6.1 MAGNETIC FLUX LEAKAGE

MFL equipment utilized consisted of an MFE Enterprises Floorscanner Type 2412.

6.2 ULTRASONIC

UT equipment utilized for the inspection was a Krautkramer Branson USN-52R Flaw Detector.

The transducer utilized was a KBA Xactex CM-HT, 7.0 MHz, 0.375 inch dual element, and a Gamma, 5.0 MHz, 0.250 inch single element,

The calibration block utilized was a 5 step, 4340 steel test block.

Echogel 20 and water was used as a couplant.

6.3 LEVEL

The level utilized was a Topcon Marksman RL-H3C rotating laser or

6.4 PIT GAUGE

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

7.0 TABLES

TABLE A
BOTTOM REDUCTION
(in inches)

SW reference corner unless otherwise indicated.

PLATE NO./ID	PIT DEPTH	REMAINING THICKNESS	X LOCATION	Y LOCATION	INT	Soil side	NE REF	*Area to be Patched	COMMENTS
5A	0.100	--	48	24	1	--	--	6X6	
28A	0.150	--	200	74	1	--	--	20X20	CZ
29A	0.150	--	288	45	1	--	--	6X6	
33A	0.100	--	59	32	1	--	--	6X6	
42A	0.200	--	213	29	1	--	--	20X20	CZ
179A	0.160	--	174	10	1	--	--	20X20	CZ

NOTES:

___ CZ	=	CRITICAL ZONE	PW	=	PUDDLE WELD
INT	=	INTERNAL	WO	=	WELD OVERLAY
LP	=	LEAK PATH	WR	=	WELD REPAIR
US	=	UNDERSIDE	CZ	=	CRITICAL ZONE
NE	=	NORTHEAST REFERENCE CORNER			
TS	=	TOMBSTONE STYLE PATCH			

***Note**: This is for reference only and weld spacing of patch plates should be verified by repair contractor.

TABLE B
SHELL READINGS
(in inches)

Course 1

Location	Stairway
1	1.116
2	1.106
3	1.085
4	1.084
5	1.086
6	1.078
7	1.079
8	1.081
9	1.079
10	1.090
Average:	1.088
Minimum:	1.078
Maximum:	1.116

Course 2

Location	Stairway
1	0.807
2	0.806
3	0.797
4	0.796
5	0.791
6	0.788
7	0.793
8	0.791
9	0.800
10	0.801
Average:	0.797
Minimum:	0.788
Maximum:	0.807

TABLE B (CONT'D)
SHELL READINGS
(in inches)

Course 3

Location	Stairway
1	0.510
2	0.495
3	0.507
4	0.494
5	0.493
6	0.504
7	0.506
8	0.508
9	0.509
10	0.540
Average:	0.507
Minimum:	0.493
Maximum:	0.540

Course 4

Location	Stairway
1	0.426
2	0.430
3	0.438
4	0.430
5	0.423
6	0.420
7	0.416
8	0.428
9	0.440
10	0.418
Average:	0.427
Minimum:	0.416
Maximum:	0.440

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
1	0.193	0.185	0.190
2	0.197	0.179	0.191
3	0.194	0.195	0.197
4	0.193	0.192	0.194
5	0.179	0.191	0.192
6	0.195	0.193	0.188
7	0.188	0.197	0.193
8	0.191	0.188	0.197
9	0.193	0.185	0.194
10	0.197	0.190	0.193
11	0.194	0.186	0.179
12	0.192	0.188	0.195
13	0.188	0.190	0.188
14	0.190	0.191	0.191
15	0.186	0.193	0.195
16	0.191	0.191	0.188
17	0.193	0.193	0.189
18	0.191	0.197	0.188
19	0.188	0.188	0.190
20	0.190	0.190	0.186
21	0.186	0.186	0.191
22	0.191	0.191	0.188
23	0.188	0.193	0.190
24	0.191	0.191	0.194
25	0.191	0.193	0.191
26	0.187	0.185	0.195
27	0.189	0.179	0.188
28	0.192	0.195	0.190
29	0.191	0.192	0.186
30	0.193	0.191	0.191
31	0.197	0.193	0.193
32	0.188	0.197	0.188
33	0.190	0.194	0.190
34	0.186	0.193	0.186
35	0.191	0.179	0.191

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
36	0.193	0.195	0.197
37	0.197	0.188	0.194
38	0.188	0.197	0.192
39	0.190	0.188	0.188
40	0.189	0.190	0.190
41	0.192	0.186	0.186
42	0.198	0.191	0.197
43	0.195	0.193	0.194
44	0.188	0.197	0.192
45	0.188	0.189	0.188
46	0.190	0.192	0.191
47	0.186	0.198	0.193
48	0.191	0.195	0.191
49	0.188	0.188	0.193
50	0.191	0.189	0.191
51	0.195	0.196	0.194
52	0.189	0.191	0.197
53	0.192	0.193	0.194
54	0.198	0.197	0.192
55	0.195	0.188	0.188
56	0.191	0.190	0.190
57	0.193	0.186	0.189
58	0.197	0.191	0.192
59	0.188	0.193	0.198
60	0.190	0.197	0.195
61	0.186	0.188	0.188
62	0.191	0.191	0.189
63	0.193	0.193	0.192
64	0.197	0.193	0.188
65	0.191	0.197	0.190
66	0.193	0.194	0.186
67	0.193	0.193	0.191
68	0.197	0.179	0.193
69	0.188	0.189	0.188
70	0.193	0.192	0.190
71	0.197	0.198	0.186

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
72	0.194	0.195	0.191
73	0.193	0.188	0.193
74	0.179	0.191	0.191
75	0.191	0.193	0.193
76	0.191	0.193	0.186
77	0.188	0.197	0.185
78	0.190	0.194	0.179
79	0.186	0.193	0.186
80	0.185	0.179	0.185
81	0.179	0.195	0.192
82	0.195	0.188	0.188
83	0.188	0.191	0.190
84	0.188	0.195	0.192
85	0.192	0.188	0.188
86	0.188	0.190	0.190
87	0.190	0.188	0.192
88	0.189	0.190	0.188
89	0.192	0.191	0.192
90	0.198	0.193	0.191
91	0.195	0.195	0.193
92	0.192	0.188	0.197
93	0.188	0.190	0.188
94	0.190	0.191	0.186
95	0.191	0.193	0.188
96	0.193	0.197	0.190
97	0.197	0.194	0.191
98	0.188	0.191	0.193
99	0.190	0.193	0.186
100	0.186	0.197	0.188
101	0.191	0.188	0.188
102	0.186	0.190	0.190
103	0.185	0.186	0.191
104	0.179	0.185	0.193
105	0.195	0.179	0.197
106	0.188	0.195	0.188
107	0.190	0.188	0.190

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
108	0.186	0.188	0.186
109	0.185	0.190	0.188
110	0.179	0.195	0.190
111	0.195	0.188	0.191
112	0.188	0.190	0.193
113	0.190	0.188	0.197
114	0.186	0.190	0.188
115	0.185	0.191	0.190
116	0.179	0.193	0.186
117	0.195	0.192	0.188
118	0.192	0.191	0.190
119	0.191	0.193	0.191
120	0.193	0.197	0.185
121	0.197	0.188	0.179
122	0.188	0.197	0.195
123	0.185	0.191	0.192
124	0.179	0.193	0.191
125	0.195	0.197	0.193
126	0.186	0.179	0.199
127	0.188	0.195	0.190
128	0.190	0.188	0.186
129	0.186	0.188	0.185
130	0.185	0.192	0.179
131	0.179	0.188	0.195
132	0.195	0.190	0.192
133	0.188	0.189	0.191
134	0.190	0.192	0.193
135	0.186	0.179	0.197
136	0.185	0.185	0.188
137	0.179	0.186	0.191
138	0.195	0.188	0.193
139	0.188	0.190	0.197
140	0.190	0.191	0.195
141	0.188	0.193	0.188
142	0.190	0.190	0.190
143	0.191	0.195	0.188

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
144	0.193	0.188	0.190
145	0.192	0.190	0.191
146	0.191	0.188	0.193
147	0.193	0.190	0.195
148	0.197	0.193	0.188
149	0.193	0.197	0.193
150	0.197	0.188	0.197
151	0.193	0.189	0.190
152	0.197	0.192	0.191
153	0.194	0.198	0.197
154	0.193	0.195	0.194
155	0.179	0.188	0.192
156	0.195	0.191	0.193
157	0.188	0.193	0.197
158	0.191	0.197	0.194
159	0.193	0.188	0.193
160	0.197	0.190	0.179
161	0.194	0.186	0.195
162	0.192	0.188	0.188
163	0.188	0.190	0.191
164	0.190	0.193	0.193
165	0.186	0.197	0.197
166	0.191	0.194	0.188
167	0.193	0.193	0.189
168	0.191	0.179	0.188
169	0.193	0.195	0.190
170	0.197	0.188	0.186
171	0.194	0.191	0.191
172	0.193	0.193	0.188
173	0.179	0.197	0.190
174	0.195	0.191	0.194
175	0.188	0.193	0.191
176	0.187	0.192	0.195
177	0.189	0.191	0.188
178	0.192	0.193	0.190
179	0.191	0.197	0.186

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
180	0.193	0.188	0.191
181	0.197	0.197	0.193
182	0.188	0.194	0.188
183	0.190	0.192	0.190
184	0.186	0.188	0.186
185	0.191	0.190	0.191
186	0.193	0.191	0.197
187	0.197	0.193	0.194
188	0.188	0.197	0.192
189	0.190	0.188	0.188
190	0.189	0.190	0.190
191	0.192	0.186	0.186
192	0.198	0.191	0.197
193	0.195	0.193	0.194
194	0.188	0.197	0.192
195	0.188	0.189	0.188
196	0.190	0.192	0.191
197	0.186	0.198	0.193
198	0.191	0.195	0.191
199	0.188	0.188	0.193
200	0.191	0.189	0.191
201	0.195	0.196	0.194
202	0.189	0.191	0.197
203	0.192	0.193	0.194
204	0.198	0.197	0.192
205	0.195	0.188	0.188
206	0.191	0.190	0.190
207	0.193	0.186	0.189
208	0.197	0.191	0.192
209	0.188	0.193	0.198
210	0.190	0.197	0.195
211	0.186	0.188	0.188
212	0.191	0.191	0.189
213	0.193	0.193	0.192
214	0.197	0.191	0.188
215	0.191	0.192	0.190

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
216	0.193	0.198	0.186
217	0.193	0.195	0.191
218	0.197	0.188	0.193
219	0.188	0.189	0.188
220	0.190	0.192	0.190
221	0.191	0.198	0.186
222	0.193	0.195	0.191
223	0.191	0.188	0.193
224	0.193	0.191	0.191
225	0.191	0.193	0.193
226	0.188	0.193	0.190
227	0.190	0.197	0.191
228	0.186	0.194	0.197
229	0.185	0.193	0.194
230	0.179	0.179	0.192
231	0.195	0.195	0.188
232	0.188	0.188	0.191
233	0.191	0.191	0.195
234	0.193	0.188	0.188
235	0.197	0.190	0.191
236	0.194	0.186	0.193
237	0.192	0.188	0.189
238	0.188	0.190	0.192
239	0.190	0.191	0.198
240	0.186	0.193	0.195
241	0.191	0.191	0.188
242	0.193	0.193	0.189
243	0.191	0.197	0.188
244	0.188	0.188	0.190
245	0.190	0.190	0.186
246	0.186	0.186	0.191
247	0.191	0.191	0.188
248	0.188	0.193	0.190
249	0.191	0.191	0.194
250	0.191	0.193	0.191
251	0.187	0.193	0.195

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
252	0.189	0.197	0.188
253	0.192	0.194	0.190
254	0.191	0.193	0.186
255	0.193	0.188	0.191
256	0.197	0.197	0.193
257	0.188	0.194	0.188
258	0.190	0.192	0.190
259	0.186	0.188	0.186
260	0.191	0.190	0.191
261	0.193	0.191	0.197
262	0.197	0.193	0.194
263	0.188	0.197	0.192
264	0.190	0.188	0.188
265	0.189	0.190	0.190
266	0.192	0.186	0.186
267	0.198	0.191	0.197
268	0.195	0.193	0.193
269	0.188	0.197	0.197
270	0.188	0.189	0.194
271	0.190	0.192	0.193
272	0.186	0.198	0.179
273	0.191	0.195	0.195
274	0.188	0.188	0.188
275	0.191	0.189	0.191
276	0.195	0.196	0.194
277	0.189	0.191	0.197
278	0.192	0.193	0.194
279	0.198	0.197	0.192
280	0.195	0.188	0.188
281	0.191	0.190	0.190
282	0.193	0.186	0.189
283	0.197	0.191	0.192
284	0.188	0.193	0.198
285	0.190	0.197	0.195
286	0.186	0.193	0.188
287	0.191	0.197	0.189

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
288	0.193	0.194	0.192
289	0.197	0.193	0.188
290	0.191	0.179	0.190
291	0.193	0.195	0.186
292	0.193	0.188	0.191
293	0.197	0.191	0.193
294	0.188	0.189	0.188
295	0.190	0.192	0.190
296	0.191	0.198	0.186
297	0.193	0.195	0.191
298	0.191	0.188	0.193
299	0.193	0.191	0.191
300	0.191	0.193	0.193
301	0.188	0.185	0.193
302	0.190	0.179	0.197
303	0.186	0.195	0.194
304	0.185	0.192	0.193
305	0.179	0.191	0.179
306	0.195	0.193	0.195
307	0.188	0.197	0.188
308	0.191	0.188	0.191
309	0.193	0.193	0.188
310	0.197	0.197	0.191
311	0.194	0.194	0.193
312	0.193	0.193	0.189
313	0.197	0.179	0.192
314	0.194	0.195	0.198
315	0.193	0.188	0.195
316	0.179	0.191	0.188
317	0.195	0.193	0.189
318	0.188	0.197	0.188
319	0.188	0.194	0.190
320	0.190	0.190	0.186
321	0.186	0.186	0.191
322	0.191	0.191	0.188
323	0.188	0.193	0.190

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
324	0.191	0.191	0.194
325	0.191	0.193	0.191
326	0.187	0.185	0.195
327	0.189	0.179	0.188
328	0.192	0.195	0.190
329	0.191	0.192	0.186
330	0.193	0.191	0.191
331	0.197	0.193	0.193
332	0.188	0.197	0.188
333	0.190	0.188	0.190
334	0.186	0.185	0.186
335	0.191	0.179	0.191
336	0.193	0.191	0.197
337	0.197	0.193	0.194
338	0.188	0.197	0.192
339	0.190	0.188	0.188
340	0.189	0.190	0.190
341	0.192	0.186	0.186
342	0.198	0.191	0.197
343	0.195	0.193	0.194
344	0.188	0.197	0.192
345	0.188	0.189	0.188
346	0.190	0.192	0.191
347	0.186	0.198	0.193
348	0.191	0.195	0.191
349	0.188	0.188	0.193
350	0.191	0.189	0.191
351	0.195	0.193	0.194
352	0.189	0.197	0.197
553	0.192	0.194	0.194
354	0.198	0.193	0.192
355	0.195	0.179	0.188
356	0.193	0.190	0.190
357	0.197	0.186	0.189
358	0.194	0.191	0.192
359	0.193	0.193	0.198

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
360	0.179	0.197	0.195
361	0.195	0.188	0.188
362	0.188	0.191	0.189
363	0.191	0.193	0.193
364	0.193	0.191	0.197
365	0.197	0.192	0.194
366	0.195	0.198	0.193
367	0.188	0.195	0.179
368	0.191	0.188	0.195
369	0.188	0.189	0.188
370	0.190	0.192	0.191
371	0.191	0.198	0.193
372	0.193	0.195	0.197
373	0.191	0.188	0.194
374	0.193	0.191	0.191
375	0.191	0.193	0.193
376	0.191	0.193	0.186
377	0.188	0.197	0.185
378	0.190	0.194	0.179
379	0.186	0.193	0.186
380	0.185	0.179	0.185
381	0.179	0.195	0.192
382	0.195	0.188	0.188
383	0.188	0.191	0.190
384	0.188	0.195	0.192
385	0.192	0.188	0.188
386	0.188	0.190	0.193
387	0.190	0.188	0.197
388	0.189	0.190	0.194
389	0.192	0.191	0.193
390	0.193	0.193	0.179
391	0.197	0.195	0.195
392	0.194	0.188	0.188
393	0.193	0.190	0.191
394	0.179	0.191	0.193
395	0.195	0.193	0.197

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
396	0.188	0.197	0.194
397	0.191	0.194	0.191
398	0.193	0.191	0.193
399	0.197	0.193	0.186
400	0.194	0.197	0.188
401	0.191	0.188	0.188
402	0.186	0.190	0.190
403	0.185	0.186	0.189
404	0.179	0.185	0.192
405	0.195	0.179	0.198
406	0.188	0.195	0.195
407	0.190	0.188	0.188
408	0.186	0.188	0.188
409	0.185	0.190	0.190
410	0.179	0.195	0.189
411	0.195	0.188	0.191
412	0.188	0.190	0.193
413	0.190	0.188	0.197
414	0.186	0.190	0.193
415	0.185	0.191	0.197
416	0.179	0.193	0.194
417	0.195	0.192	0.193
418	0.192	0.191	0.179
419	0.191	0.193	0.195
420	0.193	0.197	0.188
421	0.197	0.188	0.191
422	0.188	0.197	0.193
423	0.185	0.191	0.197
424	0.179	0.193	0.191
425	0.195	0.197	0.193
426	0.193	0.179	0.199
427	0.197	0.195	0.190
428	0.194	0.188	0.186
429	0.193	0.188	0.185
430	0.179	0.192	0.179
431	0.195	0.188	0.195

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
432	0.188	0.190	0.192
433	0.191	0.189	0.191
434	0.190	0.193	0.193
435	0.186	0.197	0.197
436	0.185	0.194	0.188
437	0.179	0.193	0.191
438	0.195	0.179	0.193
439	0.188	0.195	0.197
440	0.190	0.188	0.194
441	0.188	0.191	0.193
442	0.190	0.193	0.179
443	0.191	0.195	0.195
444	0.193	0.188	0.188
445	0.192	0.190	0.191
446	0.191	0.188	0.193
447	0.193	0.190	0.195
448	0.197	0.193	0.188
449	0.193	0.197	0.193
450	0.197	0.188	0.197
451	0.193	0.189	0.190
452	0.197	0.192	0.191
453	0.194	0.198	0.197
454	0.193	0.195	0.194
455	0.179	0.188	0.192
456	0.195	0.191	0.188
457	0.188	0.193	0.191
458	0.191	0.197	0.195
459	0.193	0.188	0.188
460	0.197	0.190	0.191
461	0.194	0.186	0.193
462	0.192	0.188	0.189
463	0.188	0.190	0.192
464	0.190	0.191	0.198
465	0.186	0.193	0.195
466	0.191	0.191	0.188
467	0.193	0.193	0.189

TABLE C
FLOATING ROOF READINGS
(in inches)

PLATE NO.	Reading 1	Reading 2	Reading 3
468	0.191	0.197	0.188
469	0.188	0.188	0.190
470	0.190	0.190	0.186
471	0.186	0.186	0.191
472	0.191	0.191	0.188
473	0.188	0.193	0.190
474	0.191	0.191	0.194
475	0.191	0.193	0.191
476	0.187	0.188	0.195
477	0.189	0.190	0.188
478	0.192	0.186	0.190
479	0.191	0.185	0.186
480	0.193	0.179	0.191
481	0.197	0.188	0.193
Min: 0.179		Avg: 0.191	

TABLE D
SUMP READINGS
(in inches)

WALL			
N	READING	S	READING
1	0.415	1	0.476
2	0.482	2	0.478
3	0.486	3	0.476
4	0.483	4	0.481
E	READING	W	READING
1	0.479	1	0.478
2	0.481	2	0.479
3	0.486	3	0.483
4	0.475	4	0.486

BOTTOM		
LOCATION	READING	READING
N	0.490	0.486
S	0.496	0.481
E	0.493	0.480
W	0.485	0.479
CENTER	0.491	0.491

8.0 WARRANTY

WARRANTY

HMT Inspection, a division of HMT, Inc. has evaluated the condition of this tank based on the observations and measurements made by the HMT Inspection tank Inspector. 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 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, HMT 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, HMT 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 HMT 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 HMT 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 HMT Inspection or any associated damage to facilities, down-time costs or claims of other damages.