

Appendix D - Tank 2007 Contruction

February 26, 1996

2393 649 050
no signature

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
Z.393 649 050

Mr. H.A. Caves, Chief
Oklahoma Department of Environmental Quality
Waste Management Division
1000 N.E. 10th Street
Oklahoma City, OK 73117-1212

Re: Wynnewood Refining Company
RCRA Permit No. 000396549
Tank 2007 Secondary Containment
Modification Request

Dear Mr. Caves:

Wynnewood Refining Company(WRC) is formally requesting approval of a modification to Permit No. 000396549 to improve the secondary containment of WRC's hazardous waste storage tank (Tank 2007) in accordance with the requirements of 40CFR 264.193. Since the Department has indicated that this is a "Class 2 modification" to the RCRA Operating Permit for Tank 2007, WRC is initiating the appropriate procedures under Oklahoma rules.

This will include a letter of notice to everyone on the ODEQ's mailing list, a published notice in the Wynnewood Gazette, and an announcement of a public meeting. A sample of the letter and notice is attached. The public meeting will be held at the main office conference room of the Wynnewood Refining Company, 906 South Powell Avenue, Wynnewood, OK 73098 on March 15, 1996 beginning at 9:00 AM. Any comments received, whether verbal or written, will be forwarded to the ODEQ.

The modification, required because the Tank 2007 system is approaching 15 years of age (March, 1996), will consist of installing a concrete liner over the entire secondary containment area and replacing the existing pipeline to Tank 2007 with a new, double-walled steel pipeline (see enclosed drawings). Most of the Part B Permit Application requirements as described in the April 8, 1994 submittal and subsequent correspondence will be unchanged. The physical description and some of the inspection requirements will be changed to correspond to the system improvements.

Page two

WRC wishes to continue the operation of the Tank 2007 system during the comment, approval, and pre-construction periods as currently permitted. Once construction starts, the tank will be emptied, moved and then replaced on the newly constructed concrete liner and put back in permitted service. The liner, external to the tank, and pipeline replacement will then be completed as quickly as possible. WRC estimates a construction period of about 5 months.

This modification will reduce the potential to release hazardous waste or hazardous constituents from the Tank 2007 system. For WRC, approval of the modification will allow continuation of a proven and successful waste management method.

For additional information, please contact Chris Hawley at 405/665-6655 or David Prucha at 405/665-6622.

Sincerely,

WYNNEWOOD REFINING COMPANY

David Roderick
Vice President Refining

0351DGP.fea

cc:

DGP

J Goodrich

LEGAL NOTICE

WYNNEWOOD REFINING COMPANY

The **WYNNEWOOD REFINING COMPANY** hereby gives Notice of the Opportunity for Public Comment on a Class 2 Modification Request for RCRA Permit Number 000396549 to add secondary containment to its permitted hazardous waste storage tank system (Tank 2007).

This permitted hazardous waste storage tank system is located within the confines of the Wynnewood Refining Company located at 906 S. Powell, Wynnewood, Oklahoma. The refinery is located in Section 23 of Township 2 North, Range 1 East of the Indian Meridian, Garvin County, Oklahoma.

All applicable information regarding this project may be reviewed during normal business hours at the following locations:

Wynnewood Refining Company
906 South Powell
Wynnewood, OK 73098
405/665-6622

Oklahoma Department of Environmental Quality
Waste Management Division
1000 N.E. 10th Street
Oklahoma City, OK 73117-1212
405/271-5338

Beginning February 26, 1996 and no later than 60 days after that date, any person may submit written comments concerning this project to the ODEQ at the above address. In addition, a public meeting is being held at the main conference room of the Wynnewood Refinery at the above listed address on March 15, 1996 at 9:00 A.M. to review this project and to take any comments. All comments received will be forwarded to the ODEQ for their consideration.

INTERNAL CORRESPONDENCE



Wynnewood
Refining
Company

TO: J. C. Hawley

DATE: January 4, 1996

FROM: D. R. Ward
665-6609

SUBJECT: Cost Estimate for
Secondary Containment
at T-2007

Attached is a "Cost Estimate" and "Scope of Work" to install secondary containment for A.P.I. sludge holding tank T-2007 and the transfer lines to the tank.

This project involves the following:

- (1) The installation of new double walled pipe from the A.P.I. traps to the sludge holding tank, T-2007.
- (2) The floating of tank T-2007 off the existing concrete ring foundation.
- (3) The installation of a grooved & epoxy coated concrete cap on the existing concrete ring.
- (4) The floating of the tank back onto the new concrete foundation.
- (5) The construction of an epoxy coated concrete diked area around the tank that would hold the volume of the tank plus an estimated 25 year, 24 hour rainfall.
- (6) The installation of a sump pump in the existing concrete sump with piping to the existing drain line.

This estimate does not include the costs of cleaning the tank, disposing of the sludge, permitting or outside engineering. A 10% contingency has been added to this estimate for a total of \$289,300.

Please let me know if you need anything else on this project, drawings, plot plans, etc., and I will be glad to help.

D.R. Ward

D. R. Ward

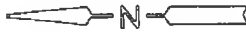
DRW/mkb

Attachment

SCOPE OF WORK
EP 95-2020-67
T-2007 SECONDARY CONTAINMENT

1. Install one 6" secondary containment sleeve under railroad. Assume one of the existing lines can be used for second sleeve.
2. Install approximately 2,000 L.F. of new 4" pipe inside a 6" sleeve from the A.P.I. trap and floating roof trap to T-2007. Leak detection vents to be installed on 6" sleeve as required.
3. Install two frack tanks for temporary storage and make temporary piping tie-ins.
4. Clean T-2007 and dispose of sludge. (NOTE: This cost not included in cost estimate)
5. Disconnect piping from T-2007 and prepare tank for floating. Install cable holds on tank and plug underground lines.
6. Construct dike around T-2007 to float tank.
7. Float tank off concrete ring.
8. Pour concrete cap on existing concrete ring. Groove slab from center to edge.
9. Coat concrete with an epoxy lining material.
10. Float tank onto new concrete slab.
11. Hook-up piping and put tank back in service.
12. Construct concrete secondary containment dike around tank. Diked area will need to contain a volume of approximately 45,000 cu. ft. Pour concrete in a way that will minimize construction joints.
13. Coat concrete with an epoxy lining material. All construction joints to be covered as recommended by epoxy lining manufacturer.
14. Electrical work as required.
15. Clean & epoxy coat existing concrete sump.
16. Install sump pump in existing concrete sump and pipe to drain line.
NOTE: Secondary containment for existing PVC drain line is not planned. This line is not considered as hazardous waste service. Also, no vapor (vent) recovery system is included.

D. R. Ward
1/3/96

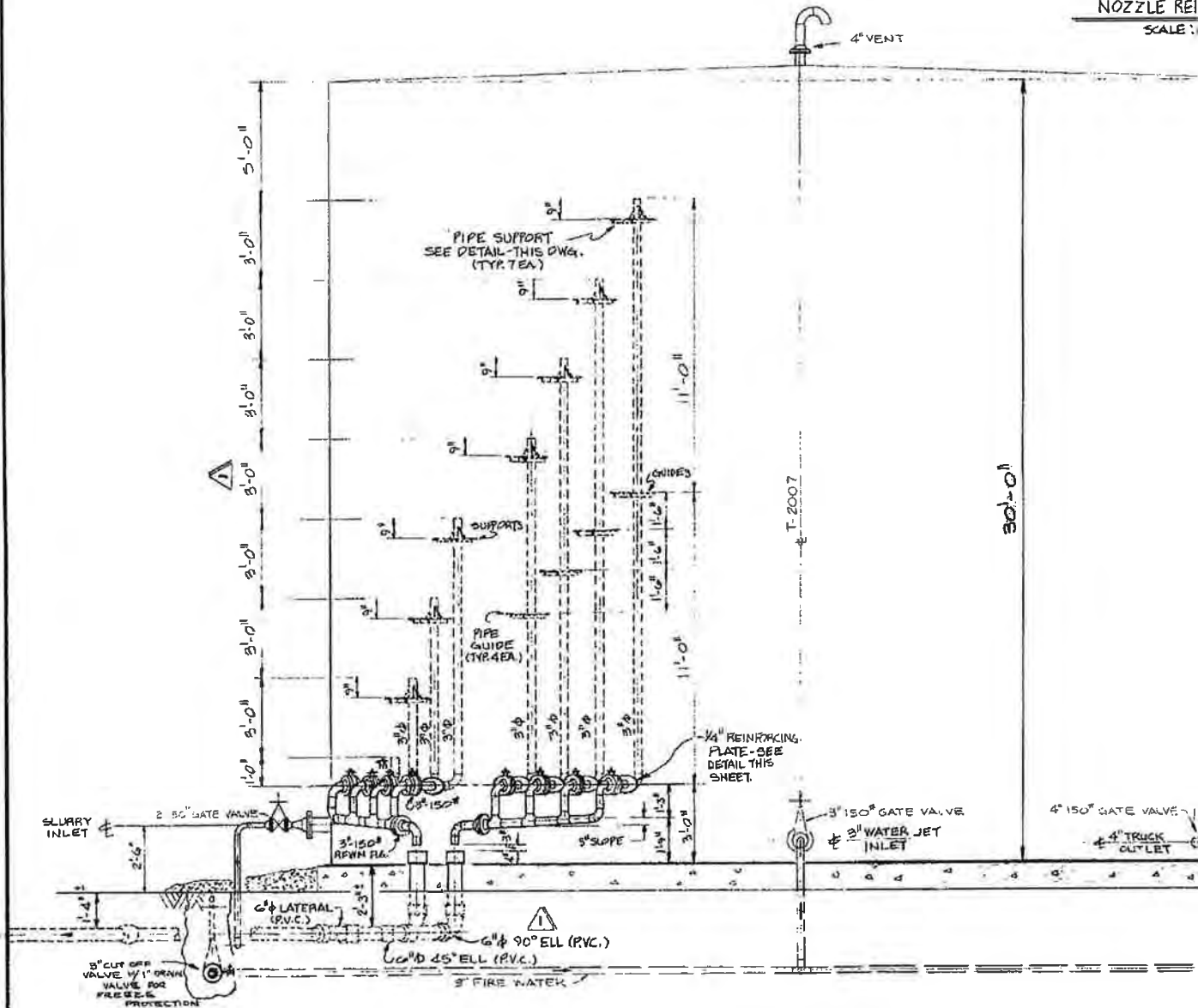


MAX. DIA. OF HOLE IN SHELL
PLATE



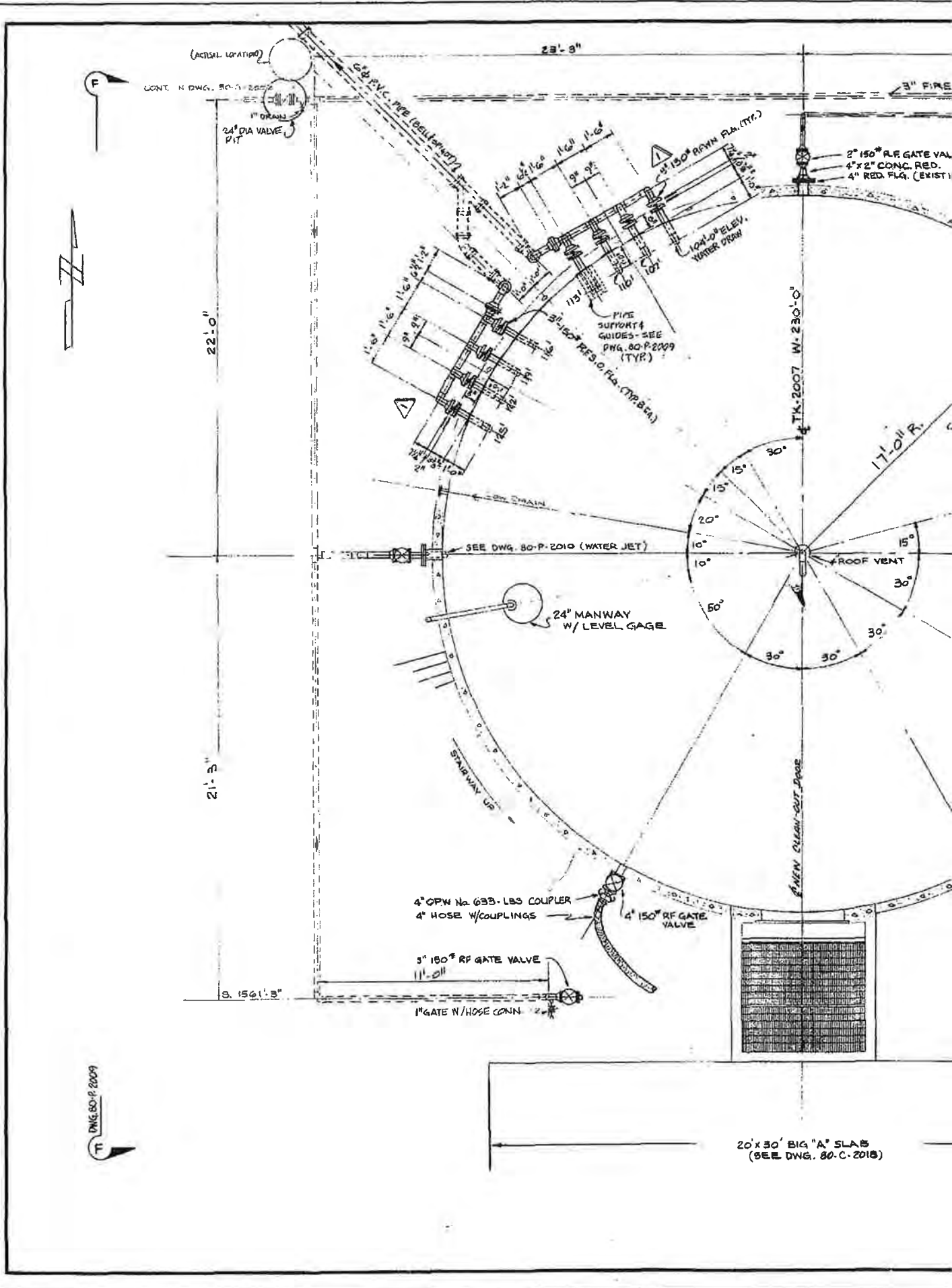
NOZZLE REIN

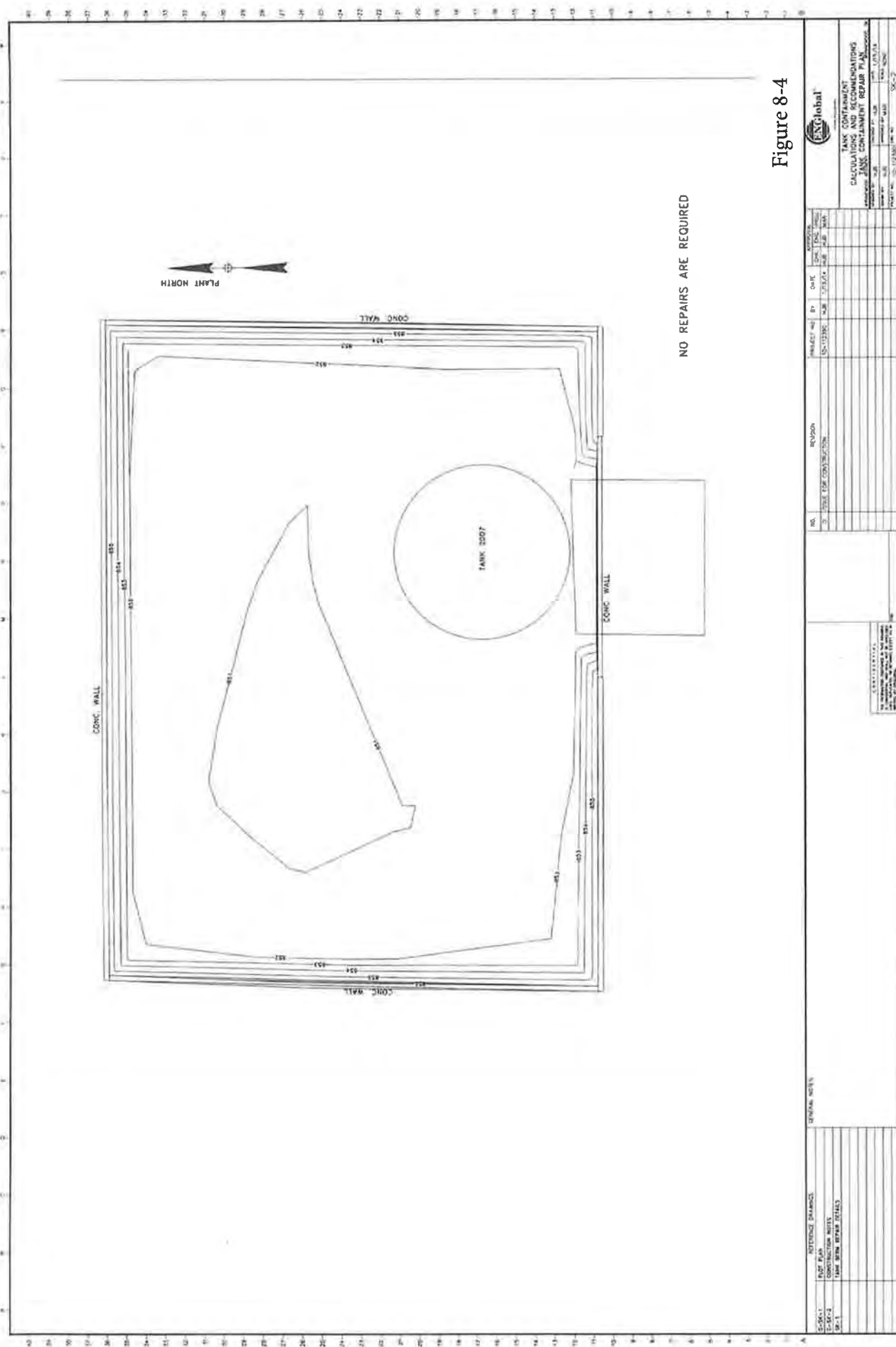
SCALE:



PIPING "F" SECTION ~ TANK 2

LOOKING EAST





TCI Tank Consultants, Inc.

A Division of **TEAM®** Team Industrial Services
4333 West 21st - Tulsa, OK 74107 - Phone (918) 583-3968 - www.tank-consultants.com

API-653 EXTERNAL TANK INSPECTION EVALUATION

Revision 1 Dated 06.29.17

Tank No: 2007

Product Service: API Separator Sludge

Inspection Date May 25, 2017

Wynnewood Refining

Wynnewood, OK 



Job  TC9831

Inspectors:

J. Varner (API-653 #67233) and A. Majors

Reviewed By



Terry Wach

PE, API-653 #50849

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Revision History

Date	No	Revision
06.14.17	0	Original Report Issued
06.29.17	1	"Unknown Steel" Plate Material Updated

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Table of Contents

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Standard Field Report

Calculations

 Survey

 Fill Height Evaluation – Unknown Steel

 Shell Corrosion Rate Evaluation – Unknown Steel

 Fill Height Evaluation

 Shell Corrosion Rate Evaluation

 Hydro-Test Evaluation

 Roof Hitch Evaluation

Equipment Calibration

 TCI Equipment and Calibration Log

Photographs

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Tank Data

Description [Units]	
Tank Type	Vertical
GPS Location [Latitude Longitude]	34.6304 -97.1704
Nominal Diameter/Width [FT]	35.00
Nominal Height [FT]	29.00
Fill Height [FT]	29.00
Nominal Capacity	4,969 BARRELS
Year Built	1949
Built By	Unknown
Construction Standard	Unknown
Name Plate Information	The tank did not have a nameplate. The tank was re-erected around March of 1981
Product Stored	API Separator Sludge
Product Specific Gravity	1.00
Foundation	Concrete Ringwall
Bottom Construction	Welded
Bottom Installation Date	Unknown or N/A
Bottom Slope	Unknown
Bottom Coating	Unknown
Shell Construction	Welded
Shell Material	Unknown
Fixed Roof Type	Cone
Floating Roof Type	None
Scope of Work - Inspection Type(s)	EXTERNAL

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Evaluation Summary

General

The fill height for this tank is 29 feet. The tank experiences buildup of solids settling from the water. TCI was contracted to determine the maximum height of solid buildup allowable with the remainder of the tank filled with water. TCI was asked to run the existing shell as "unknown steel" per API 653. It was requested a 5-year corrosion allowance be applied in determining this height. **The fill height analysis found the tank was adequate for continued service with a solid (specific gravity of 1.5) height of 13.04 feet and a total product (specific gravity of 1.0) height of 29. The inspection interval is 5 years for the next external inspection. The next external inspection should be performed by May 2022.**

If hydrotested, the tank could be filled to 29 feet.

The valve of Shell Nozzle D was leaking. **Consideration should be given to servicing the valve when the tank is next out of service.**

Foundation

The tank was surveyed externally. The details of that survey can be found in the Appendix. The settlement data shows the tank to be 0.60 inches out of level with the low point located at or near Survey Point 7 or 85.47 feet counter-clockwise from Survey Point 1. Survey Point 1 was located at or near East Manway A, and the survey proceeded counter-clockwise around the tank shell perimeter. The largest out-of-plane settlement was 0.30 inches. A maximum permissible out-of-plane settlement of 0.72 inches was calculated per API-653, Appendix B.3.2.2. None of the survey points exceed this value. **No corrective action is recommended.**

The concrete ringwall had hairline cracks. No rebar was exposed. **The cracks should have a sealant applied and be monitored at future inspections.**

There were gaps between the bottom extension and concrete ringwall up to 1.50 inches wide. **These areas should be evaluated internally when the tank is next out of service.**

There was moss growing under the bottom extension. **The moss can retain moisture and should be removed.**

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

External Shell

There was a 12-inch area of surface rust due to mechanical damage located 76.70 feet counter-clockwise from East Manway A. There was coating failure on the bottom extension. The bolts of Shell Items A, C, F, G, H, I, J, K, L, M, and V were rust stained. There was coating failure on Shell Items O and V. **Any areas of coating failure with corrosion or uncoated areas with corrosion should be cleaned and painted.**

The weld spacings of Shell Nozzles J and X did not meet API standards. **Because the tank shell is 0.5 inches or less in thickness, no corrective action is required.**

External Roof

The tank did not have a dedicated roof hitch. Roof Pressure/Vacuum Vent A was evaluated and found to be unacceptable for use as a scaffold hitch based on calculations. **Consideration should be given to installing a dedicated roof hitch.**

The external roof and roof appurtenance coating was in fair condition with staining. **Any areas of coating failure with corrosion or uncoated areas with corrosion should be cleaned and painted.**

The seal of Roof Pressure/Vacuum Vent D was damaged and the cover was open at the time of inspection. **The vent should be serviced to ensure proper operation.**

Access Structures

There was coating failure with rust staining on the northeast side of the platform. **Any areas of coating failure with corrosion or uncoated areas with corrosion should be cleaned and painted.**

The platform handrail height was 37 inches as compared to the OSHA minimum of 42 inches.

The roof handrail height was 37 inches as compared to the OSHA minimum of 42 inches.

API-653 EXTERNAL TANK INSPECTION EVALUATION	
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Appendix

Standard Field Report

Calculations

Survey

Fill Height Evaluation – Unknown Steel

Shell Corrosion Rate Evaluation – Unknown Steel

Fill Height Evaluation

Shell Corrosion Rate Evaluation

Hydro-Test Evaluation

Roof Hitch Evaluation

Equipment Calibration

TCI Equipment and Calibration Log

Photographs

TCI	Tank Consultants, Inc. • 4333 West 21st • Tulsa, OK 74107 • (918) 583-3968 • tank-consultants.com			
Customer	Wynnewood Refining	WYNN	Tank No	2007
City, ST	Wynnewood, OK	Location	Inspected	05.25.2017
Scope	EXTERNAL		Job No	TC9831

Inspection Information

Inspectors	J. Varner (API-653 #67233) and A. Majors
Scope of Work	EXTERNAL

Tank / Nameplate Information		Latitude	34.6304	Longitude	-97.1704
DIAMETER [FT]	35.00	HGT [FT]	29.00	LEN [FT]	BARRELS/GALLONS
Circumference [FT]	109.96	FILL HGT	29.00	Capacity	4,969 BARRELS
Year Built	1949	MFG	Unknown		
Shell Material	Unknown				
	Other				
	<input type="checkbox"/> PWHT - Post Weld Heat Treat				
Construction	<input type="radio"/> API-650 <input type="radio"/> API-620 <input type="radio"/> API-12C <input type="radio"/> API-12F <input type="radio"/> UL <input type="radio"/> STI <input type="radio"/> ASME <input type="radio"/> SWRI <input checked="" type="radio"/> Unknown				
Standard	Edition				
API	Appendices				
Other Nameplate Information	The tank did not have a nameplate.				
	The tank was re-erected around March of 1981				

Tank Type / Description

Tank Type	<input checked="" type="radio"/> Vertical <input type="radio"/> Horizontal <input type="radio"/> Rectangle <input type="radio"/> Tote <input type="radio"/> Other				
	Other				
Head Type	<input type="radio"/> Flat <input type="radio"/> Dished <input type="radio"/> Hemi <input type="radio"/> Elliptical <input type="radio"/> Other <input type="radio"/> None <input checked="" type="radio"/> N/A				
	Other				
Foundation	<input type="radio"/> Grade Material <input type="radio"/> Grade <input type="radio"/> Crushed Stone <input type="radio"/> Sand/Soil <input checked="" type="radio"/> Concrete Ringwall <input type="radio"/> Ringwall				
	<input type="radio"/> Concrete Pad <input type="radio"/> Steel Saddles <input type="radio"/> Concrete Saddles <input type="radio"/> Saddles <input type="radio"/> Skids <input type="radio"/> Platform/Legs				
	<input type="radio"/> Unknown <input type="radio"/> Other				
	Other				
Bottom Construction	<input checked="" type="radio"/> Welded <input type="radio"/> Riveted <input type="radio"/> Other		Date Installed	Unknown or N/A	
	Other				
	<input type="checkbox"/> Double Bottom	<input checked="" type="checkbox"/> Leak Detection			
	<input type="checkbox"/> Cathodic Protection	Date Installed	Unknown or N/A		
Bottom Slope	<input type="radio"/> Cone Up <input type="radio"/> Cone Down <input type="radio"/> Flat <input type="radio"/> Drain Dry <input type="radio"/> Wedge <input checked="" type="radio"/> Unknown <input type="radio"/> Dished				
Bottom Coating	<input type="radio"/> None <input type="radio"/> Thin Film Epoxy <input type="radio"/> Thick Fiberglass <input checked="" type="radio"/> Unknown <input type="radio"/> Other				
	Other		Date Installed	Unknown or N/A	
Shell Construction	<input checked="" type="radio"/> Welded <input type="radio"/> Riveted <input type="radio"/> Other				
	Other				
	<input type="checkbox"/> Insulated	<input checked="" type="checkbox"/> Cut Down and Re-Erected			
	<input type="checkbox"/> Lap Welded	<input type="checkbox"/> Double Wall			
Access/Ladder	<input checked="" type="radio"/> Spiral <input type="radio"/> Radial <input type="radio"/> Vertical Ladder <input type="radio"/> Catwalk <input type="radio"/> Other				
	Other				
Product Storage	API Separator Sludge		GRAVITY	1.00	API 10.0
	<input type="checkbox"/> Product Heated	Max Temp [F]	Level [FT]		
Fixed Roof Type	<input checked="" type="radio"/> Cone <input type="radio"/> Open <input type="radio"/> Dome <input type="radio"/> Geodesic Dome <input type="radio"/> Other <input type="radio"/> N/A				
	Other				
Floating Roof Type	<input checked="" type="radio"/> None <input type="radio"/> Open Floating Roof <input type="radio"/> Internal Floating Roof <input type="radio"/> N/A				
	Other				
	<input type="checkbox"/> Primary Seal	<input type="checkbox"/> Internal Vertical Ladder			
	<input type="checkbox"/> Secondary Seal	<input type="checkbox"/> External Rolling Ladder			

Previous Inspection History / External Coating Date

Internal Inspection	Unknown or N/A	External	Unknown or N/A	Paint	Unknown or N/A
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Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Location	Inspected
Scope	EXTERNAL	Job No	TC9831

Foundation

Foundation Type And Details	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
------------------------------------	-------------------------------------	------------------------------

- ☐ Grade Material ☐ Grade ☐ Crushed Stone ☐ Sand/Soil ☒ Concrete Ringwall ☐ Ringwall
☐ Concrete Pad ☐ Steel Saddles ☐ Concrete Saddles ☐ Saddles ☐ Skids ☐ Platform/Legs
☐ Unknown ☐ Other

Other

Ringwall Dimensions

Distance From Shell to Edge of Ringwall
Distance From Top of Ringwall to Grade

MIN [IN] MAX [IN]

7.5 -9

5.5 6.5

[FT]

Saddles

Number / Quantity
Saddle Width [IN]

Distance Between Saddles
Distance From End

Anchor

Number / Quantity
Bolt Diameter [IN]
Spacing [FT]

- ☐ OK
☐ Corroded threads
☐ Loose nuts

Foundation Failure Condition(s)	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
--	-------------------------------------	------------------------------

- ☐ Obvious Settlement
☐ Discontinuous Ringwall
☐ Broken Concrete
☐ Exposed Rebar
☐ Washed Out Areas

- ☐ Grade sloped toward tank
☐ Grade against tank
☐ Standing water against tank
☐ Void areas under tank

Saddle Failure Condition(s)

- ☐ No Pad Plates
☐ Saddle Corrosion

- ☐ Pad Plates Not Seal Welded

Housekeeping Around the Tank	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
-------------------------------------	-------------------------------------	------------------------------

If there is a small amount of debris or vegetation, note in comments but do not check the associated boxes.

- ☐ Excessive Vegetation
☐ Buildup of Debris

- ☐ Deterioration of dike wall
☐ Deterioration of tank berm

Foundation Comments

Document the locations, sizes, and severity of foundation failure items (broken concrete, missing concrete, etc.).

The concrete ringwall had hairline cracks. No rebar was exposed.

There were gaps between the bottom extension and concrete ringwall up to 1.50 inches wide.

There was moss growing under the bottom extension.

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Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

External Shell

Shell Distortion and Buckling	☉ OK	○ NOT OK
--------------------------------------	------	----------

- ☐ Major Buckles
☐ Minor Buckles

☐ Distortion Around Piping

Describe Shell Distortion and Buckling Problems Found

Document the locations, sizes, and severity of any buckles, distortion, flat spots, or peaking or banding at weld joints.

Comments

Shell Improper Construction Practices	☉ OK	○ NOT OK
--	------	----------

- ☐ Square Corner Insert Plates
☒ Weld Spacings not to API STD's
☐ Lap Welded Patches
☐ Unreinforced Penetrations

☐ Telltale Holes Plugged
☐ No Telltale Holes
☐ Other

Describe Shell Improper Construction Practices Problems Found

List all shell appurtenances that lack repads or have weld spacings not to API standards, mechanically plugged repad telltale holes, repad telltale holes clogged with dirt and/or paint, or repads that lack telltale holes.

Note if further engineering review may be required for an item.

Comments

The weld spacings of Shell Nozzles J and X did not meet API standards.

Ground Cables	☉ OK	○ NOT OK
----------------------	------	----------

Document the ground cable locations.

- ☐ Broken Cable
☐ Broken Shell Attachment

☐ None Found

Level Gauge	☉ OK	○ NOT OK
--------------------	------	----------

Equipment Manufacturer Type/Model

Varec 2500

- ☐ Tape Does Not Have Free Movement
☐ Floats, Guides or Attachments Not in Working Order

Product Leaks	☉ OK	○ NOT OK
----------------------	------	----------

Document the locations and severity of any product leaks.

Comments

The valve of Shell Nozzle D was leaking.

Additional Problems Found

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Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

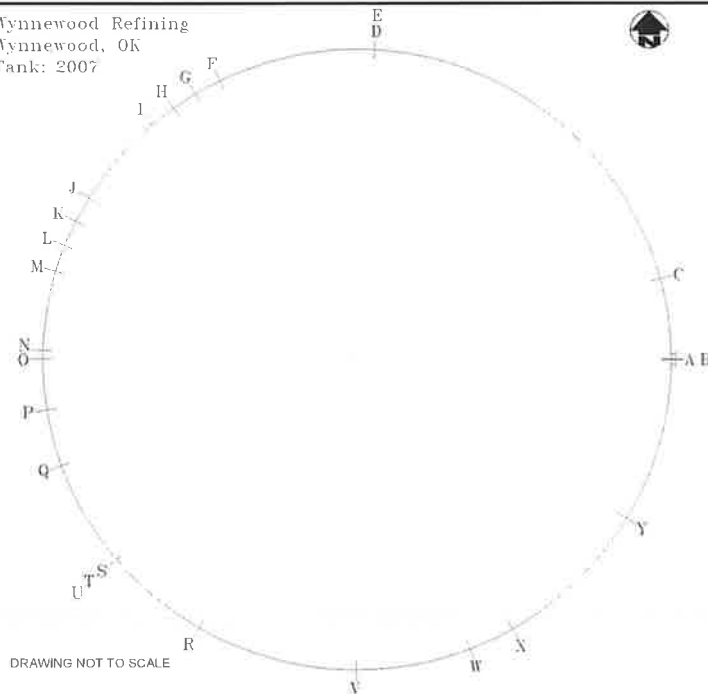
Record the general nozzle orientation on diagram below.

Inspect and record shell nozzle details on the shell nozzles and appurtenances page.

Starting Location: _____ East Manway A _____ Direction: _____ CCW _____

Nozzle Layout

Wynnewood Refining
Wynnewood, OK
Tank: 2007



Document split repads, insulated nozzles, the presence of foam chambers, and other notable appurtenance features for informational purposes.

If there are any manways/nozzles with mixer nozzles, for each manway document the mixer nozzle diameter, the mixer nozzle thickness, the external and internal projection measurements of the nozzle, the manway cover/nozzle blind thickness, and the manway/nozzle flange thickness.

Comments

There were ground cables located 93.70, 17.80, and 51.90 feet counter-clockwise from East Manway A.

Shell Manway A was located on Shell Thickened Insert B.

Shell Nozzle D was located on Shell Thickened Insert E.

Shell Nozzle O was located on Shell Thickened Insert N.

TCI	Tank Consultants, Inc. • 4333 West 21st • Tulsa, OK 74107 • (918) 583-3968 • tank-consultants.com		
Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Location		Job No	TC9831
Scope	EXTERNAL		

Shell Vertical Seams

Vertical Seam Locations - For Ring 1					
1	15.70	11	21	31	
2	45.75	12	22	32	
3	65.38	13	23	33	
4	95.52	14	24	34	
5		15	25	35	
6		16	26	36	
7		17	27	37	
8		18	28	38	
9		19	29	39	
10		20	30	40	

Top Angle, Wind Girder and Shell Vents		⊙ OK	○ NOT OK
<input type="checkbox"/> Corrosion <input type="checkbox"/> Buckling <input type="checkbox"/> Broken Welds		<input type="checkbox"/> Detached <input type="checkbox"/> Coating Failure <input type="checkbox"/> No Top Angle	

Dimensions [IN]	Top Angle	Wind Girder
Vertical Leg	2.5	
Horizontal Leg		
Thickness	0.196	
Distance From Roof	0	

Record the quantity and size of all shell vents. Measure the "Distance From Roof" value from the bottom of the vent. If the measurement cannot be taken from the bottom of the vent, measure from the top of the vent, note that the distance was measured from the top, and document why.

Shell Vents	Quantity	0	Size	Distance From Roof
Comments				

Shell Ring Heights, Thickness Readings and Construction

For Ring 1: Shell plates measured at the four quadrants. Courses measured at 12" above the bottom, the middle of the course and 12" below the top of the course. For Upper Rings: Thickness of each ring measured at 3 points minimum per ring. Joint Type - butt welded, lap welded, butt riveted, lap riveted. Rivet Seal Type - Unsealed Rivets, Seal Welded Rivets, Epoxy Sealed Rivets.								
Total	29.44		Thickness [IN] Readings @			Joint	Nbr	
Ring	Height [FT]	Nominal	Bottom	Middle	Top	Type	Rivets	Rivet Seal Type
1A	7.17	0.219	0.196	0.212	0.203	Butt Welded		
1B			0.211	0.218	0.229			
1C			0.195	0.191	0.190			
1D			0.194	0.207	0.192			
2	8.02	0.219	0.224	0.217	0.193	Butt Welded		
3	8.02	0.219	0.182	0.206	0.180	Butt Welded		
4	6.02	0.188	0.160	0.167	0.150	Butt Welded		

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Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

Access Structures	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
--------------------------	--	-------------------------------------

- | | |
|---|--|
| <input type="checkbox"/> Broken Welds | <input type="checkbox"/> Cable Members |
| <input type="checkbox"/> Bent Members | <input type="checkbox"/> Corrosion |
| <input checked="" type="checkbox"/> Coating Failure | <input type="checkbox"/> Chain Members |

Stairway

- | | |
|-----------------------------------|--|
| <input type="checkbox"/> Radial | <input checked="" type="checkbox"/> Spiral |
| <input type="checkbox"/> Catwalk | <input type="checkbox"/> Ladder |
| Other <input type="text"/> | |

Structure

- | | |
|---|----------------------------------|
| <input checked="" type="checkbox"/> Platform | <input type="checkbox"/> Walkway |
| <input checked="" type="checkbox"/> Roof Handrail | |
| Other <input type="text"/> | |

DIMENSIONS	OSHA REQ	EXISTING					
		PLATFORM		ROOF HANDRAIL			
Width [IN]	MIN 24"	27.00					
Length [IN]	MIN 24"	45.00		96.00			
Toe Board Height [IN]	MIN 4"	4.25		4.00			
Handrail Height [IN]	MIN 42"	37.00		37.00			
Spacing of Uprights [IN]	MAX 96"	44.50		45.00			
Size of Upright Member	Note ²	1" square bar		1" square bar			
		YES	NO	YES	NO	YES	NO
Midrail Present ¹	REQ'D	⊙	○	⊙	○	○	○
Slip-Resistant Surface	REQ'D	⊙	○	○	⊙	○	○
NOTES: ¹ - The spacing of uprights may meet the intentions of the OSHA midrail requirement. ² - 2x2x3/8" or 1.5" pipe minimum							
STAIRWAY							
DIMENSIONS	OSHA REQ	EXISTING		DIMENSIONS	OSHA REQ	EXISTING	
Width [IN]	MIN 22"	28.00		Width [IN]	MIN 16"		
Rise [IN] / Run [IN]	-	9.00	9.00	Height [FT]	MAX 30'		
Angle [Degrees]	30 - 50	45.00		Rung-to-Rung [IN]	10" - 14"		
Handrail Height [IN]	30" - 36"	31.00		Rung-To-Shell [IN]	MIN 7"		
Upright Member Size	NOTE ¹	1" square bar		Rung Size [IN]	MIN 3/4"		
Upright Spacing [IN]	MAX 96"	9.50		Rung-To-Cage [IN]	27" - 30"		
STAIRWAY Properties		YES	NO	Cage Verticals [IN]	MAX 9.5"		
Midrail ² (REQ'D)	0	○	⊙	Cage Hoops [FT]	MAX 8'		
Slip-Resistant (REQ'D)	1	⊙	○	Rung-to-Roof [IN]	1.5" - 12"		
NOTES: 1 - 2x2x3/8" or 1.5" pipe minimum 2 - The spacing of uprights may meet the intentions of the OSHA midrail requirement.							

Access Structures - Describe Problems Found

There was coating failure with rust staining on the northeast side of the platform.

TCI	Tank Consultants, Inc. • 4333 West 21st • Tulsa, OK 74107 • (918) 583-3968 • tank-consultants.com		
Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

External Fixed Roof - Cone

Adverse Condition(s)	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
-----------------------------	-------------------------------------	------------------------------

- | | |
|--|---|
| <input type="checkbox"/> Hole(s) | <input type="checkbox"/> Excessive Waviness |
| <input type="checkbox"/> Areas That Hold Water | <input type="checkbox"/> Corrosion Damage |
| <input type="checkbox"/> Active Corrosion | |

Coating Condition(s)	<input checked="" type="radio"/> OK	<input type="radio"/> NOT OK
-----------------------------	-------------------------------------	------------------------------

- | | |
|-----------------------------------|---|
| Condition | <input type="radio"/> Like New <input type="radio"/> Good <input checked="" type="radio"/> Fair <input type="radio"/> Poor <input type="radio"/> None |
| <input type="checkbox"/> Peeling | <input checked="" type="checkbox"/> Stained |
| <input type="checkbox"/> Cracking | <input type="checkbox"/> Insulated |
| <input type="checkbox"/> Thin | |

Venting Type(s), Quantity, Setting(s) and Condition(s)	Quantity	1
---	-----------------	---

- | | |
|--|---|
| <input type="checkbox"/> Missing/Damaged Parts | <input type="checkbox"/> Flame Arrestor |
| <input type="checkbox"/> Screens Missing/Damaged | <input type="checkbox"/> Corrosion Damage |
| <input type="checkbox"/> Painted Closed | <input type="checkbox"/> Service Vents |
| <input type="checkbox"/> Unknown Venting | |

Document the reason for any vent that requires service.

	Vent 1	Vent 2	Vent 3	Vent 4
Number	Pressure/Vacuum			
Type	8			
Size	Endaro			
Manufacturer	Model 660			
Serial Number	unknown			
Settings				
Other				
Misc Comments	The seal of Roof Pressure/Vacuum Vent D was damaged and the cover was open at the time of inspection.			

Roof Slope (As Measured with a 2' - 4' Level)	Rise [IN]	1.75	Run [IN]	24
--	------------------	------	-----------------	----

Problem Detail(s)

Describe and document any external roof problems, including the location, size, and severity of the problem for each applicable item. For moderate-to-severe corrosion, document pit depths and locations.

--

Additional Comments

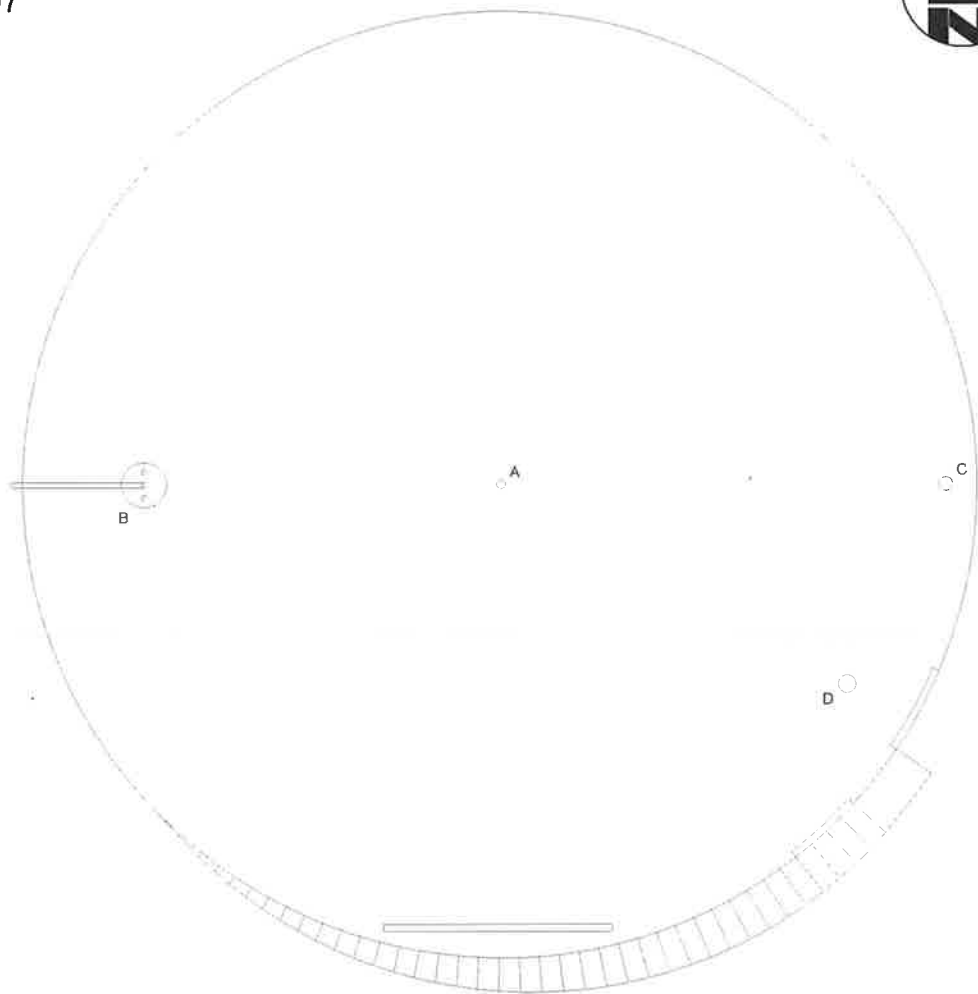
The tank did not have a dedicated roof hitch.

TCI	Tank Consultants, Inc. • 4333 West 21st • Tulsa, OK 74107 • (918) 583-3968 • tank-consultants.com		
Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

External Fixed Roof - Cone

Fixed Roof Layout

WYNNEWOOD REFINING
WYNNEWOOD, OK
TANK: 2007



DRAWING NOT TO SCALE



Tank Consultants, Inc. 4333 West 21st Tulsa, OK 74107 (918) 583-3968 tank-consultants.com

Customer

Tank No

2007

City, ST

Inspected

05.25.2017

Location**Job No**

TC9831

Scope

EXTERNAL

External Fixed Roof Fittings

- ☐ Items Not Coated
- ☐ Missing Nuts or Bolts

Note: Positive radius values are distances from center. Negative radius values are distances from shell

[illegible]

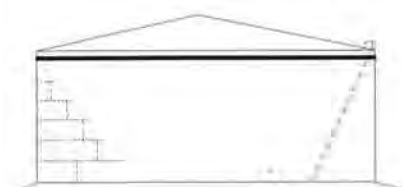


Tank Consultants, Inc.

4333 West 21st
Tulsa, OK 74107
(918) 583-3968 Fax (918) 583-3966
www.tank-consultants.com

API-653 Tank Settlement Evaluation

Job Number - TC9831



Wynnewood Refining

Wynnewood, OK

Tank No - 2007

Survey Date - 05.25.2017

Report Date - 05.25.2017

Foundation Type	Concrete Ringwall	Diameter [FT]	35.00
Bottom Construction	Lap Welded	Height [FT]	29.00
Fixed Roof Type	Cone		
Bottom Shape	Unknown	Year Built	1949
Bottom Coating	Unknown	Construction Code	Unknown
Product	API Separator Sludge		
Specific Gravity	1.00		

Surveyed By

J. Varner (API-653 #67233) and A. Majors

Prepared By

T. Wach, PE (API-653 #50849)

Tank - 2007 Settlement Evaluation Report
Wynnewood Refining
Location - Wynnewood, OK

Job Number - TC9831
Report Date - 05.25.2017
API-653 Tank Settlement Evaluation

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Settlement Summary Data / Calculations.....	4
Settlement Charts.....	5
Field Data.....	7

Settlement Evaluation Summary

Wynnewood Refining contracted with Tank Consultants, Inc. to provide an external settlement survey for Tank 2007 located in Wynnewood, OK. The settlement evaluation was per API-653, 5th Edition, November 2014 Appendix B. According to records provided by the customer, the tank was built in with an unknown construction standard. The tank has a concrete ringwall foundation. The tank was in service and consequently only external bottom survey data was available and collected. The product level in the tank at the time was unknown.

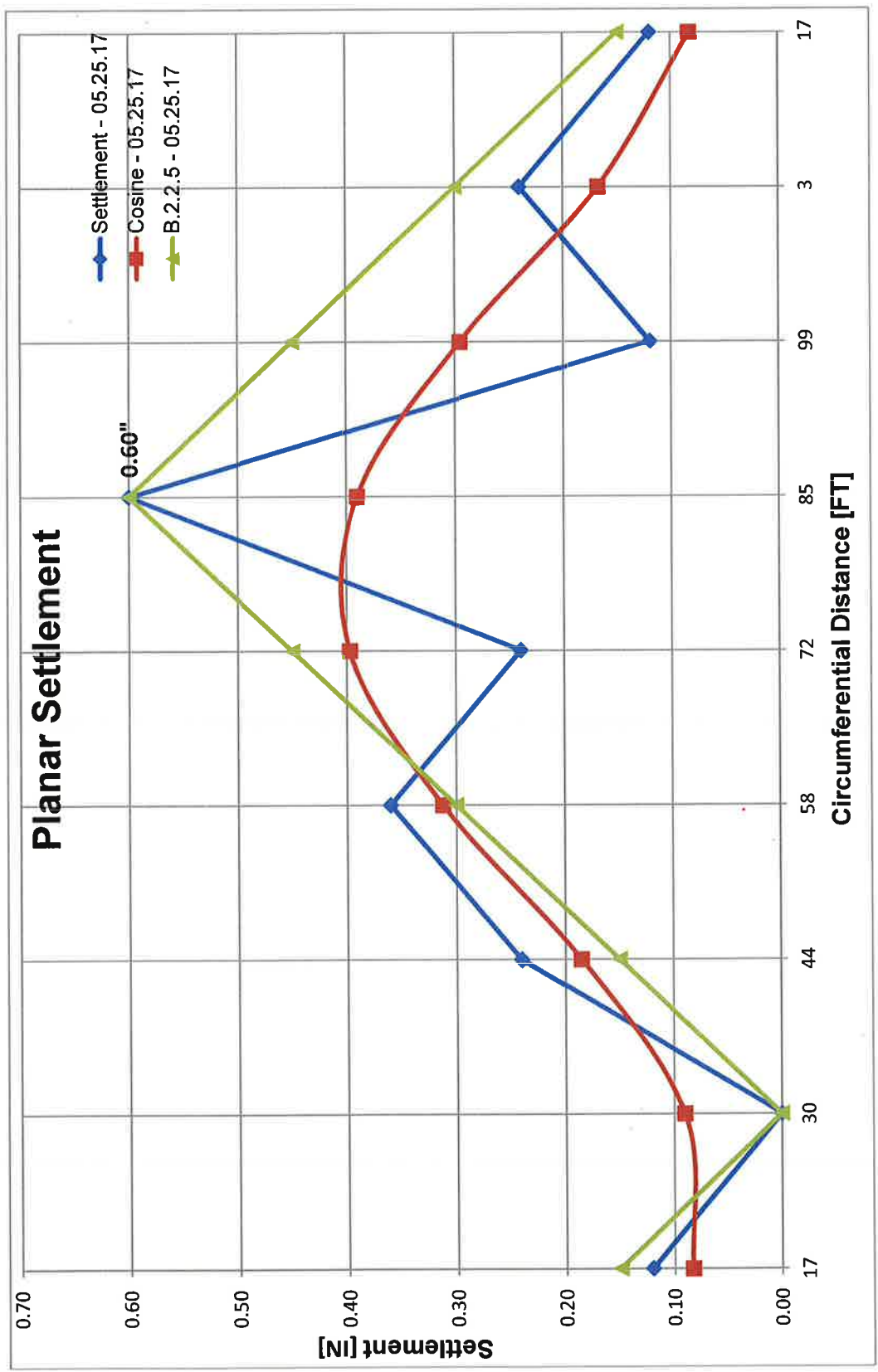
The elevation survey consisted of 8 survey points equidistant around the tank shell perimeter. Survey Point 1 was located at or near East Manway A, and the survey proceeded counter-clockwise around the tank shell perimeter.

The settlement data was fitted to an optimum cosine curve using the least squares method and plotted in graph form. The settlement data shows the tank to be 0.60 inches out of level with the low point located at or near Survey Point 7 or 85.47 feet counter-clockwise from Survey Point 1. The measure of statistical validity (R^2) was 0.48 per B.2.2.4.e. The procedures of API-653, Appendix B.2.2.5 were used to establish the settlement arc for computing the out-of-plane or differential settlement.

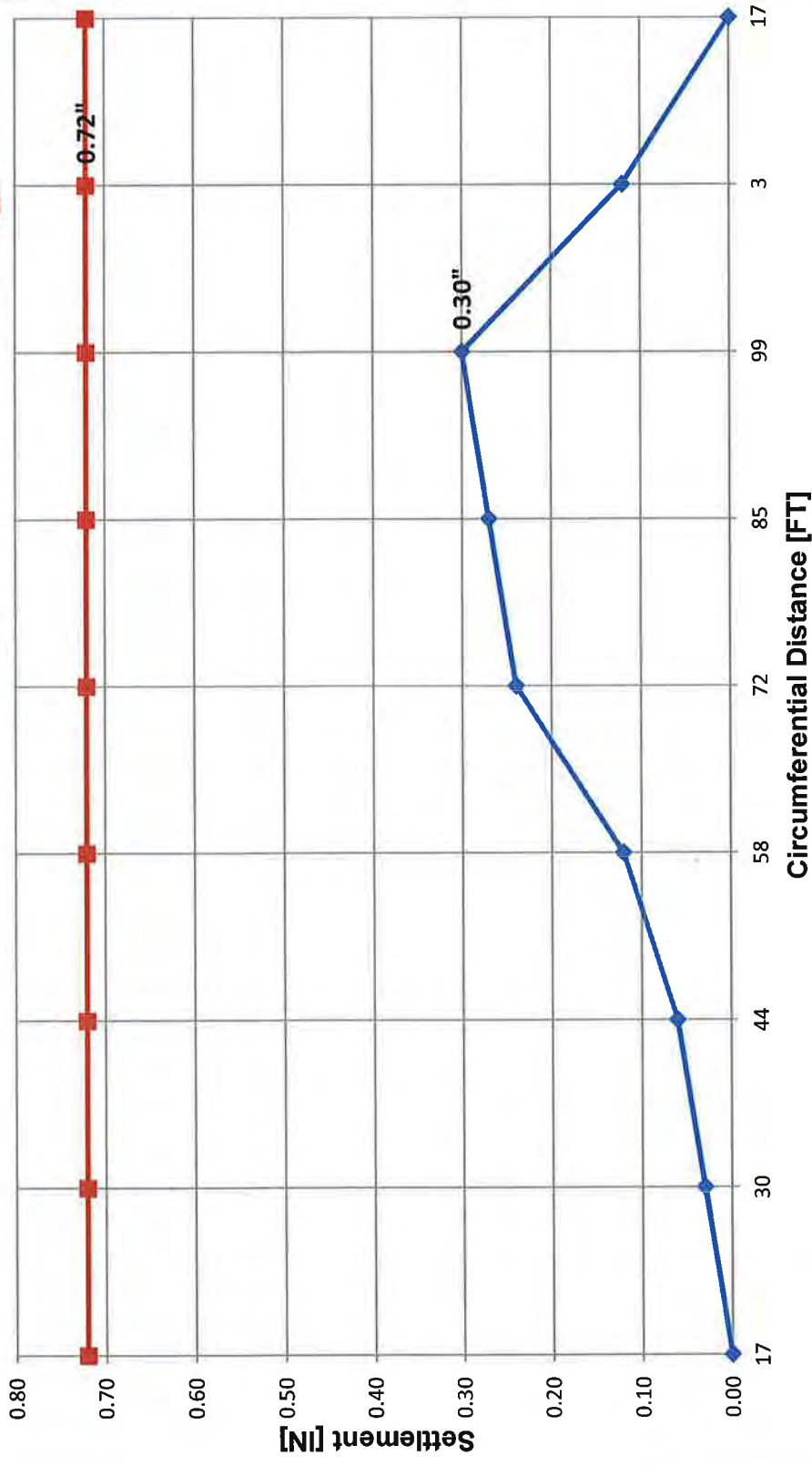
The out-of-plane, or differential settlement, was calculated for each actual survey point's elevation and plotted in graph form. The largest out-of-plane settlement was 0.30 inches. A maximum permissible out-of-plane settlement of 0.72 inches was calculated per API-653, Appendix B.3.2.2. None of the survey points exceed this value.



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Out-of-Plane or Differential Settlement





Customer Wynnewood Refining
Location Wynnewood, OK
Surveyed By J. Varner (API-653 #67233) and A. N

Tank No 2007
Date Surveyed 05.25.17
Job Number TC9831

Tank Diameter 35 [FT]
Tank Height 29 [FT]
Actual Product Level [FT]
Foundation Type Concrete Ringwall
Fixed Roof Type Cone

Radial 1 Survey Starts @ East Manway A
Survey Direction [CW/CCW] Counter-Clockwise
Number of Radials 8
Actual Radial Spacing [FT] 13.74
Inverted Elevations TRUE

Radial Number	Distance [FT]	Set Up - Rod Readings/Elev's [FT] @ Bottom @ Shell				Ring 1 Hgt [IN]	Elevation [FT]		Settlement [IN]
		#1	#2	#3	#4		Change	Absolute	
1	3.00	4.66					0.00	0.00	0.24
2	16.74	4.65					0.01	0.01	0.12
3	30.49	4.64					0.02	0.02	0.00
4	44.23	4.66	4.92				0.00	0.00	0.24
5	57.98		4.93				-0.01	-0.01	0.36
6	71.72		4.92				0.00	0.00	0.24
7	85.47		4.95	4.85			-0.03	-0.03	0.60
8	99.21			4.81			0.01	0.01	0.12
9	3.00			4.79			0.03	0.03	-0.12
10									
11									
12									
13									
14									
15									
16									
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31									
32									
33									
34									
35									
36									
		Benchmark Rod Reading [FT] @ Set Up #					Elevation [FT]		
		#1	#2	#3	#4		Adjust	BM	
							0.00		
BM									
Benchmark Location Description									

Calculations - Minimum Elevation @ Radial, Elevation, Total Settlement

7

-0.03

0.60

Fill Height Analysis**One-Foot**

To determine the maximum allowable buildup
of Solids in Water

per API-650 5.6.3 and API-653 4.3.3

Ref API-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)

TCI Tank Consultants, Inc.

Job Number: TC9831

Customer Name: Wynnnewood Refining

Location: Wynnnewood, OK

Tank Number: 2007

Inspection Date: 5/25/2017

DESIGN DATA:

35.00 ft	0.00 in	Diameter
29.00 ft	0.00 in	Height Water
13.00 ft	0.50 in	Height Solids

4	Number of Shell Rings
1.00	Specific Gravity (Water)
1.50	Specific Gravity (Solids)

653	API Analysis (new = 650, existing = 653, pressurized = 620)
200 °F	Design Temperature

CALCULATIONS:

Shell Course	Shell Height H_{ring} (in)	Solids Fill Ht. H (ft)	Water Fill Ht. H (ft)	Plate Material	Allowable Stress S (psi)	Vertical Seam Type per API-653 Table 4.2	Joint Eff. E	Calculated Minimum T_{min} (in)	Corrosion Allowance CA (in)	Thickness Measured T_{actual} (in)	UT type used	Maximum Fill Height (ft)	Fill Ht Check
Ring No. 1	86.00	13.04	15.96	Unknown	23,595	Unknown Butt-Weld	0.70	0.1819		0.1900	Min	15.97	OK
Ring No. 2	96.20	5.88	15.96	Unknown	23,595	Unknown Butt-Weld	0.70	0.1227		0.1930	Min	24.23	OK
Ring No. 3	96.20	0.00	13.82	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1800	Min	29.42	OK
Ring No. 4	72.20	0.00	5.80	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1500	Min	29.42	OK

29.22 ft Total Ring Height

Maximum Fill Height: 15.97 ft

2.50 in Top Angle Height (if any)

12,548 Cu Ft

29.42 ft Total Shell Height

1,174 Kips

Nominal Volume of Solids:

Nominal Weight of Solids:

Refer to API-650 5.6.3 and API-653 4.3.3 for application of the One-Foot method.

For T_{min} :

The fill height analysis found that this tank was adequate for continued service with a Solids (SG = 1.5) height of 13.04 feet and a Water (SG = 1) height of 29 feet.

$$t_{min} \approx \frac{2.6(H-1)D_{avg}}{S E}$$

NOTES:

The tank experiences build-up of solids settling from water. Fill Height is 29 feet. This evaluation finds the height of solids buildup within the water to be acceptable up to 15.97 feet without applying corrosion allowance. TCI was asked to provide a 5-year corrosion allowance be applied in determining this height. When the corrosion rate is applied the maximum fill height of the solids is 13.04 feet.

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Version 1.33

Corrosion Rate Analysis

To determine the external inspection and ultrasonic thickness inspection interval per API-653 Sections 6.3.2 and 6.3.3

Ref API-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)

TCD Tank Consultants, Inc.

Job Number: TC9831

Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

DESIGN DATA:

35.00 ft 0.00 in Diameter
29.00 ft 0.00 in Height of Water
13.00 ft 0.50 in Height of Solids

653 API Analysis
1.00 Specific Gravity (Water)
1.50 Specific Gravity (Solids)

5/25/2017 Date of Inspection

ANALYSIS CRITERIA:

- 1) This analysis was based on long-term corrosion rates using the minimum UT reading per shell course.
- 2) This analysis compares the corrosion rate of all shell rings using the One-Foot method.

CALCULATIONS:

Shell Course	Date of Construction	Age of Shell (yr)	Joint Eff. E	Allowable Stress S (psi)	Calculated Minimum T_{min}	Nominal T_{nom}	Current T_{actual}	Long-Term Loss (in)	Rate (in/yr)	Short-Term	Critical Corrosion Rate (in/yr)	Remaining Life (yr)	External Interval (yr)	UT Interval (yr)
Ring No. 1	1/1/1946	71.39	0.70	23,595	0.1819	0.2188	0.1900	0.0288	0.00040		long-term 0.00040	20.00	5.00	10.00
Ring No. 2	1/1/1946	71.39	0.70	23,595	0.1227	0.2188	0.1930	0.0258	0.00036		long-term 0.00036	194.53	5.00	15.00
Ring No. 3	1/1/1946	71.39	0.70	25,960	0.1000	0.2188	0.1800	0.0388	0.00054		long-term 0.00054	147.21	5.00	15.00
Ring No. 4	1/1/1946	71.39	0.70	25,960	0.1000	0.1880	0.1500	0.0380	0.00053		long-term 0.00053	93.94	5.00	15.00

Minimum remaining life: 20.00 yr

External inspection interval (5 yr max): 5.00 yr

Ultrasonic testing interval (15 yr max): 10.00 yr

Next external inspection by: May 2022

Next UT reading by: May 2027

NOTES:

Per previous report, tank was constructed in 1946 and re-constructed around March of 1981.

Fill Height Analysis One-Foot

To determine the allowable
product fill height

per API-650 5.6.3 and API-653 4.3.3

Ref API-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)



Job Number: TC9831

Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

Inspection Date: 5/25/2017

DESIGN DATA:

35.00 ft	0.00 in	Diameter
29.00 ft	0.00 in	Shell Height
29.00 ft	0.00 in	Liquid Level

4	Number of Shell Rings
1.00	Specific Gravity

653	API Analysis (new = 650, existing = 653, pressurized = 620)
200 °F	Design Temperature

CALCULATIONS:

Shell Course	Shell Height H_{ring} (in)	Product Fill Ht. H (ft)	Plate Material	Allowable Stress S (psi)	Vertical Seam Type per API-653 Table 4.2	Joint Eff. E	Calculated Minimum T_{min} (in)	Corrosion Allowance CA (in)	Thickness Measured T_{actual} (in)	UT type used	Maximum Fill Height (ft)	Fill Ht Check
Ring No. 1	86.00	29.00	Unknown	23,595	Unknown Butt-Weld	0.70	0.1543		0.1900	Min	29.42	OK
Ring No. 2	96.20	21.83	Unknown	23,595	Unknown Butt-Weld	0.70	0.1148		0.1930	Min	29.42	OK
Ring No. 3	96.20	13.82	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1800	Min	29.42	OK
Ring No. 4	72.20	5.80	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1500	Min	29.42	OK

29.22 ft Total Ring Height

Maximum Fill Height: 29.42 ft

2.50 in Top Angle Height (if any)
29.42 ft Total Shell Height

Nominal Volume: 27,901 Cu Ft
4,969 BBL

Refer to API-650 5.6.3 and API-653 4.3.3 for application of the One-Foot method.

For T_{min} :

$$t_{min} = \frac{2.6(H - 1) D \Delta G}{S E}$$

The fill height analysis found that this tank was adequate for continued service with a fill height of 29 feet using a specific gravity of 1.

NOTES:

The tank experiences build-up of solids settling from water. Fill Height of water is 29 feet. This evaluation proves water height does not control tank fill limitations.

Corrosion Rate Analysis

To determine the external inspection and
ultrasonic thickness inspection interval
per API-653 Sections 6.3.2 and 6.3.3

Ref API-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)

TCI Tank Consultants, Inc.

Job Number: TC9831

Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

DESIGN DATA:

35.00 ft 0.00 in Diameter
29.00 ft 0.00 in Shell Height
29.00 ft 0.00 in Liquid Level

653 API Analysis
200 °F Design Temperature
1.00 Specific Gravity

5/25/2017 Date of Inspection

ANALYSIS CRITERIA:

- 1) This analysis was based on long-term corrosion rates using the minimum UT reading per shell course.
- 2) This analysis compares the corrosion rate of all shell rings using the One-Foot method.

CALCULATIONS:

Shell Course	Date of Construction	Age of Shell (yr)	Joint Eff. E	Allowable Stress S (psi)	Calculated Minimum T_{min}	Nominal T_{nom}	Current T_{actual}	Long-Term Loss (in)	Rate (in/yr)	Short-Term	Critical Corrosion Rate (in/yr)	Remaining Life (yr)	External Interval (yr)	UT Interval (yr)
Ring No. 1	1/1/1949	68.39	0.70	23,595	0.1543	0.2188	0.1900	0.0288	0.00042		long-term 0.00042	84.85	5.00	15.00
Ring No. 2	1/1/1949	68.39	0.70	23,595	0.1148	0.2188	0.1930	0.0258	0.00038		long-term 0.00038	207.35	5.00	15.00
Ring No. 3	1/1/1949	68.39	0.70	25,960	0.1000	0.2188	0.1800	0.0388	0.00057		long-term 0.00057	141.02	5.00	15.00
Ring No. 4	1/1/1949	68.39	0.70	25,960	0.1000	0.1880	0.1500	0.0380	0.00056		long-term 0.00056	89.99	5.00	15.00

Minimum remaining life: 84.85 yr
External inspection interval (5 yr max): 5.00 yr
Ultrasonic testing interval (15 yr max): 15.00 yr

Next external inspection by: May 2022
Next UT reading by: May 2032

NOTES:

Per previous report, tank was constructed in 1946 and re-constructed around March of 1981.

Hydrostatic Testing One-Foot



Tank Consultants, Inc.

Job Number: TC9831

Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

Inspection Date: 5/25/2017

To determine the allowable
product fill height

per API-650 5.6.3.2 and API-653 4.3.3.2

Ref API-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)

DESIGN DATA:

35.00 ft 0.00 in Diameter 653 API Analysis (new = 650, existing = 653)
29.00 ft 0.00 in Shell Height 200 °F Design Temperature
29.00 ft 0.00 in Liquid Level

CALCULATIONS:

Shell Course	Shell Height H _{ring} (in)	Product Fill Ht. H (ft)	Plate Material	Allowable Stress S _t (psi)	Joint Eff. E	Calculated Minimum T _{min} (in)	Corrosion Allowance CA (in)	Thickness Measured T _{actual} (in)	Maximum Test Ht (ft)	Fill Ht Check
Ring No. 1	86.00	29.00	Unknown	25,960	0.70	0.1402		0.1900	29.00	OK
Ring No. 2	96.20	21.83	Unknown	25,960	0.70	0.1043		0.1930	29.00	OK
Ring No. 3	96.20	13.82	Unknown	27,000	0.70	0.1000		0.1800	29.00	OK
Ring No. 4	72.20	5.80	Unknown	27,000	0.70	0.1000		0.1500	29.00	OK

29.22 ft Total Ring Height

Maximum Test Height: 29.00 ft

2.50 in Top Angle Ht. (if any)

Nominal Volume: 27,901 Cu Ft

29.42 ft Total Shell Ht

4,969 BBL

Refer to API-650 5.6.3.2 and API-653 4.3.3.2 for application of hydrotesting.

For T_{min}:

If hydrotested, the tank could be filled to 29 feet.

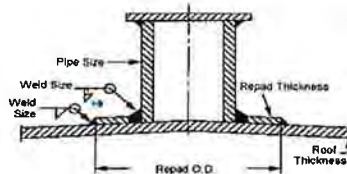
$$t_{min} = \frac{2.6(H-1) \cdot Dia \cdot G}{S \cdot E}$$

NOTES:

Roof Hitch Suitability**TO DETERMINE THE ACCEPTABILITY
OF ROOF STRUCTURES FOR
USE AS SCAFFOLD HITCHES**

Ref: Roark's Formulas for Stress and Strain 6th Ed.

AISC ASD 13th Ed

TCI Tank Consultants, Inc.Job Number: **TC9831**Customer Name: **Wynnewood Refining**Location: **Wynnewood, OK**Tank Number: **2007**Nozzle: **Roof Pressure/Vaccum Vent A**A repad is
present.

Input	Where	
<u>4</u> in	d_p	Pipe Diameter
<u>0.177</u> in	t_p	Thickness of Pipe
<u>0.250</u> in	w_p	Size of Pipe-to-Roof/Repad Weld
<u>0.250</u> in	w_r	Size of Roof-to-Repad Weld
<u>0.155</u> in	t_1	Thickness of Roof
<u>35.00</u> in	d_r	Diameter of Repad
<u>0.248</u> in	t_2	Thickness of Repad
Constants	Where	
<u>5000</u> lbf	L	Horizontal Load on Scaffold Hitch
<u>1.00</u> in	h	Height of Rope Above Roof Plate
<u>AISC-ASD</u>	SF	Safety factor
<u>29000</u> ksi	E	Modulus of Elasticity of steel
<u>33</u> ksi	F_{yp}	Minimum Yield Stress of Pipe
<u>30</u> ksi	F_{ypl}	Minimum Yield Stress of Plate
Output	Where	
<u>5.00</u> in-kips	M	Moment on Structure
<u>4.50</u> in	d_o	Outer Pipe Diameter
<u>4.17</u> in	d_i	Inner Pipe Diameter
<u>0.16</u> in	t_{pd}	Design Thickness of Pipe
<u>2.24</u> in ²	A_p	Cross Section Area of Pipe
<u>2.344</u> in ³	Z	Elastic Section Modulus of Pipe
<u>3.095</u> in ³	Z_p	Plastic Section Modulus of Pipe
<u>13.291</u> kips	Vn/SF	Allowable Shear Strength for Pipe
<u>61.17</u> in-kips	Mn/SF	Allowable Flexural Strength for Pipe
<u>0.473</u> kips/in	W_p	Load Per Inch on Pipe-to-Roof/Repad Weld
<u>0.046</u> kips/in	W_r	Load Per Inch on Roof-to-Repad Weld
<u>3.182</u> kips/in	Fw/SF	Allowable Weld Strength Pipe-to-Roof/Repad Weld
<u>3.182</u> kips/in	Fw/SF	Allowable Weld Strength Roof-to-Repad Weld
<u>7.63</u>	β_1	Formula Constant for Pipe-to-Roof/Repad Interface
<u>0.47</u>	β_2	Formula Constant for Repad-to-Roof Interface
<u>0.2925</u> in	T	Effective Thickness of Roof plate and Repad
<u>25.50</u> ksi	σ_{max1}	Maximum Stress on Pipe-to-Roof/Repad Interface
<u>5.06</u> ksi	σ_{max2}	Maximum Stress on Roof-to-Repad Interface
<div> Will the pipe support the load? <u>Yes</u> Will the weld support the load? <u>Yes</u> Will the pipe-to-roof/repad interface support the load? <u>No</u> Will the roof to repad interface support the load? <u>Yes</u> Is the structure acceptable for use as a scaffold hitch? No </div>		

Roof Pressure/Vaccum Vent A was evaluated and found to be unacceptable for use as a scaffold hitch based on calculations.
Consideration should be given to installing a dedicated roof hitch

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TCI EQUIPMENT AND CALIBRATION LOG

Date: 5.25.2017 Company: Wynnewood Refining Location: Wynnewood, OK
Job#: TC9831 Tank/Component#: 2007 Component: Carbon
Material: Carbon

Magnetic Flux Leakage Equipment: ☐ YES ☒ N/A (if not used) ☐ Procedure TCI-MFL-1 (Referenced for Inspection)

Model (circle one)	TC2000 or MST-10	Bridge S/N	
Date of Function Test	Date	Electronics S/N	
Unit Final Electronics Module		Time of Function Test	
Calibration Scale		Cal Value	
Height Settings: Bridge/Magnets		Sensors Bar	

Equipment function tested and set-up for this job by: _____

Ultrasonic Test Equipment: ☒ YES ☐ N/A (if not used) ☒ Procedure TCI-UT-1 (Referenced for Inspection)

Unit Calibrations: (Thickest and Thinnest Blocks Used – Start, Mid-Day and Shut Down)

Thickness Meter <input checked="" type="checkbox"/> YES <input type="checkbox"/> N/A (if not used)		
Brand	Olympus	
Model	38 DL Plus	
Serial Number	161367709	
Calibration Date	5.25.2017	
Transducer Serial #	Black 921622	
Transducer Size	0.434	
Transducer Frequency	5 MHz	
Couplant	Sound Safe	
Cal Block Thickness	Instrument Reading	Time
0.100-0.500	0.100-0.500	9:00 am
0.100-0.500	0.100-0.500	11:00 am

Flaw Detector <input type="checkbox"/> YES <input checked="" type="checkbox"/> N/A (if not used)		
Brand		
Model		
Serial Number		
Calibration Date	Date	
Transducer Serial #		
Transducer Size		
Transducer Frequency	MHz	
Couplant		
Cal Block Thickness	Instrument Reading	Time

Calibration Blocks: List all blocks used on this job. If more space is needed, use comment section.

Brand	<u>Olympus</u>	<u>N/A</u>	<u>N/A</u>
Serial Number	<u>125716</u>	<u> </u>	<u> </u>
Material	<u>Carbon Steel</u>	<u> </u>	<u> </u>
Number of Steps	<u>5</u>	<u> </u>	<u> </u>
Step Increments	<u>0.100</u>	<u> </u>	<u> </u>

Laser Level ☒ YES ☐ N/A (if not used)

Brand	<u>CST/Berger</u>
Model	<u>ALHV</u>
Serial Number	<u>017564</u>
Calibration Date	<u>8/1/2016</u>
Receiver Serial Number	<u>601000165</u>

Total Station ☐ YES ☒ N/A (if not used)

Brand	<u> </u>
Model	<u> </u>
Serial Number	<u> </u>
Calibration Date	<u>Date</u>
Receiver Serial Number	<u> </u>

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Magnetic Particle ☐ YES ☒ N/A (if not used)

☐ Procedure TCI-MT-1 (Referenced for Inspection)

Yoke Brand _____
Yoke Serial Number _____
Black Light Source _____
Type of Particulate: Wet/Dry / Visible/Fluorescent _____
Batch #(s) _____

Yoke Model _____
Yoke Current Type AC _____
Black light meets/exceeds 1000 $\mu\text{w}/\text{cm}^2$ ☐ YES ☐ NO
Trade Name _____

Vacuum Box ☐ YES ☒ N/A (if not used)

☐ Procedure TCI-VBT-1 (Referenced for Inspection)

Light Source Used _____

Light intensity exceeds 1000 Lux (100fc)? ☐ YES ☐ NO

Test (Bubble) _____
Solution Used _____
Example: Seamtest, Windshield Washer Fluid, Snoop

Solution Effective Temperature Range _____ °F

Is the vacuum box gauge in good condition? ☐ YES ☐ NO

Place vacuum box on weld seam and note vacuum reading on gauge _____
If reading is less than 16" HG, contact Equipment Manager.

Using the infrared thermometer, determine the temperature of the floor to be tested.

Floor SURFACE temperature _____ °F Ambient air temperature _____ °F

Tank Strapping ☐ YES ☒ N/A (if not used)

Strapping Tape S/N _____
Strapping Tape Calibration Date _____ Date _____

Dye Penetrant ☐ YES ☒ N/A (if not used)

☐ Procedure TCI-PT-1 (Referenced for Inspection)

Type of Penetrant	_____	Can Batch Number(s)	_____
Type of Cleaner	_____	Can Batch Number(s)	_____
Type of Emulsifier	_____	Can Batch Number(s)	_____
Type of Developer	_____	Can Batch Number(s)	_____

Comments:

List of Special Equipment if Used:

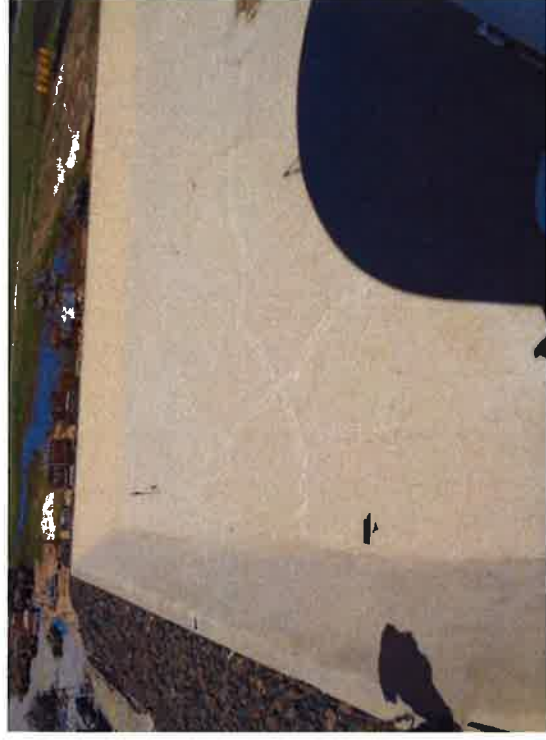
Areas of Restricted Access:

TCI OPERATOR: J. Varner

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1A



1B



1C



1D



2A



2B



2C



2D



3A



3B



3C



3D



4A



4B



4C



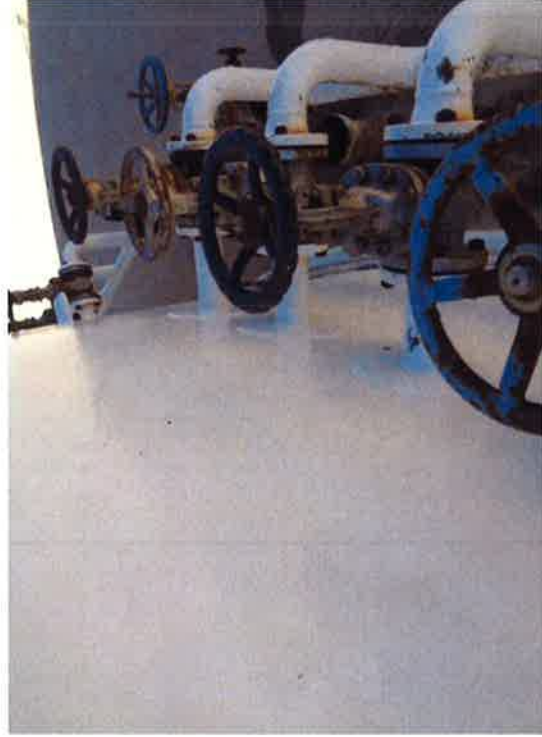
4D



5A



5B



5C



5D



6A



6B



6C



6D



7A



7B



7C



7D



8A



8B



8C



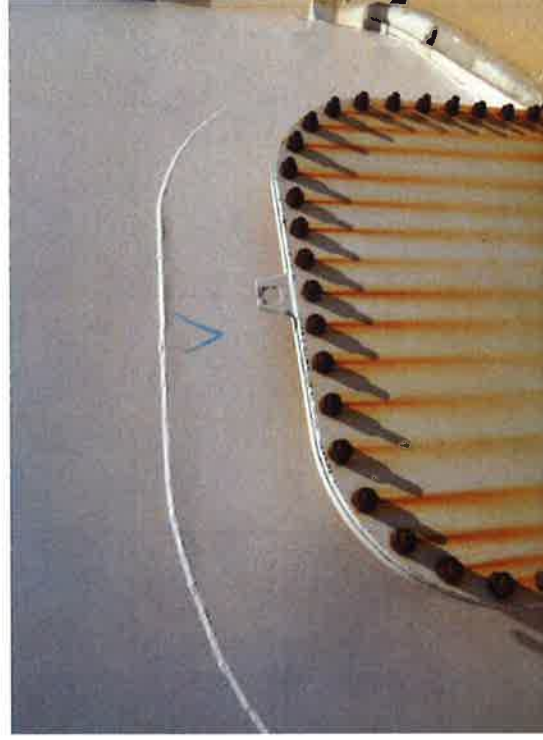
8D



9A



9B



9C



9D



10A



10B



10C



10D



11A



11B



11C



11D



12A



12B



12C



12D



13A



13B



13C



13D



14A



14B



14C



14D