Appendix D - Tank 2007 Contruction

February 26, 1996

2393 649 050 na 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.

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

J. C. Hawley TO:

January 4, 1996 DATE:

Wynnewood Refining Company

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:

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

DR Ward

DRW/mkb

Attachment

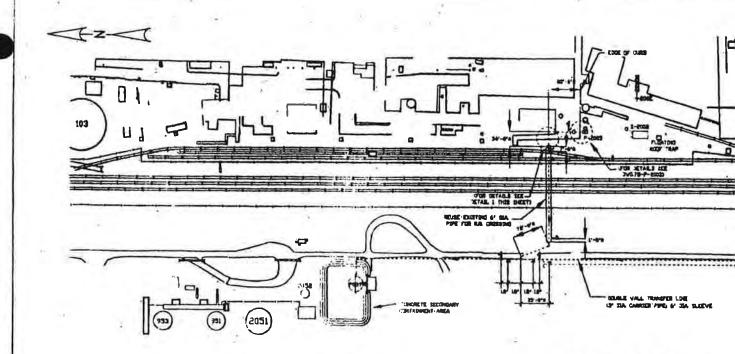
SCOPE OF WORK EP 95-2020-67 T-2007 SECONDARY CONTAINMENT

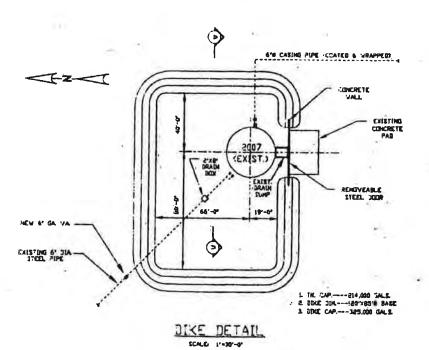
- 1. Install one 6" secondary containment sleeve under railroad. Assume one of the existing lines can be used for second sleeve.
- 2. Install approximately 2,000 L.F. of new 4" pipe inside a 6" sleeve from the A.P.I. trap and floating roof trap to T-2007. Leak detection vents to be installed on 6" sleeve 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.

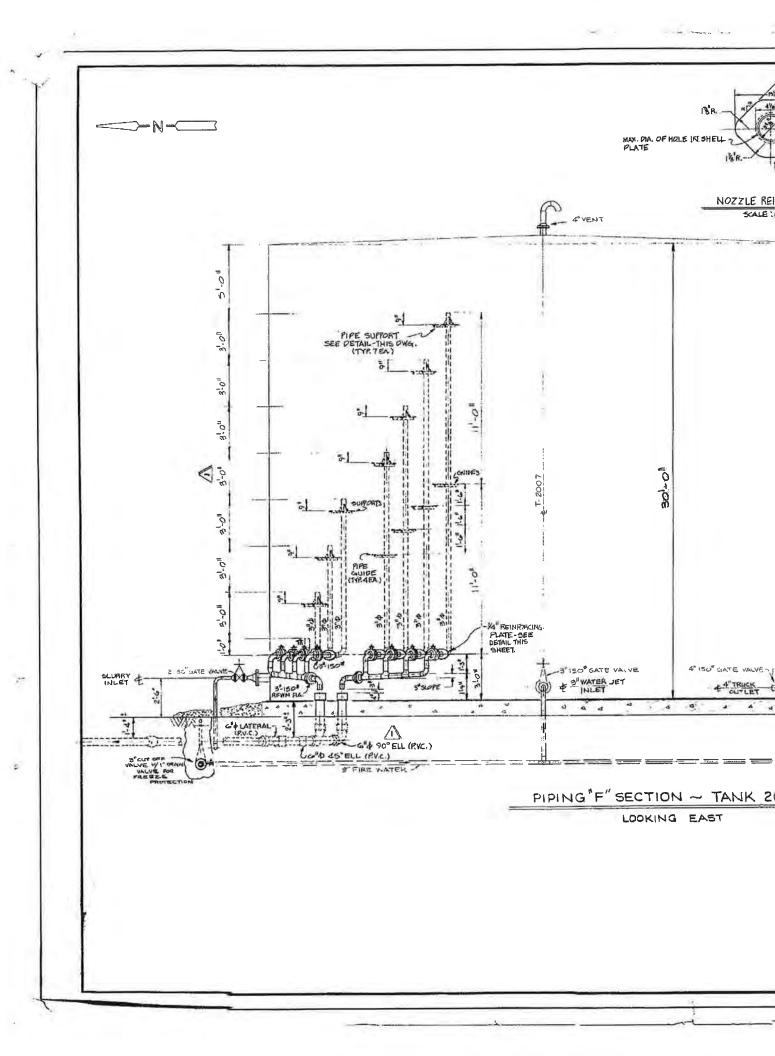
D. R. Ward 1/3/96

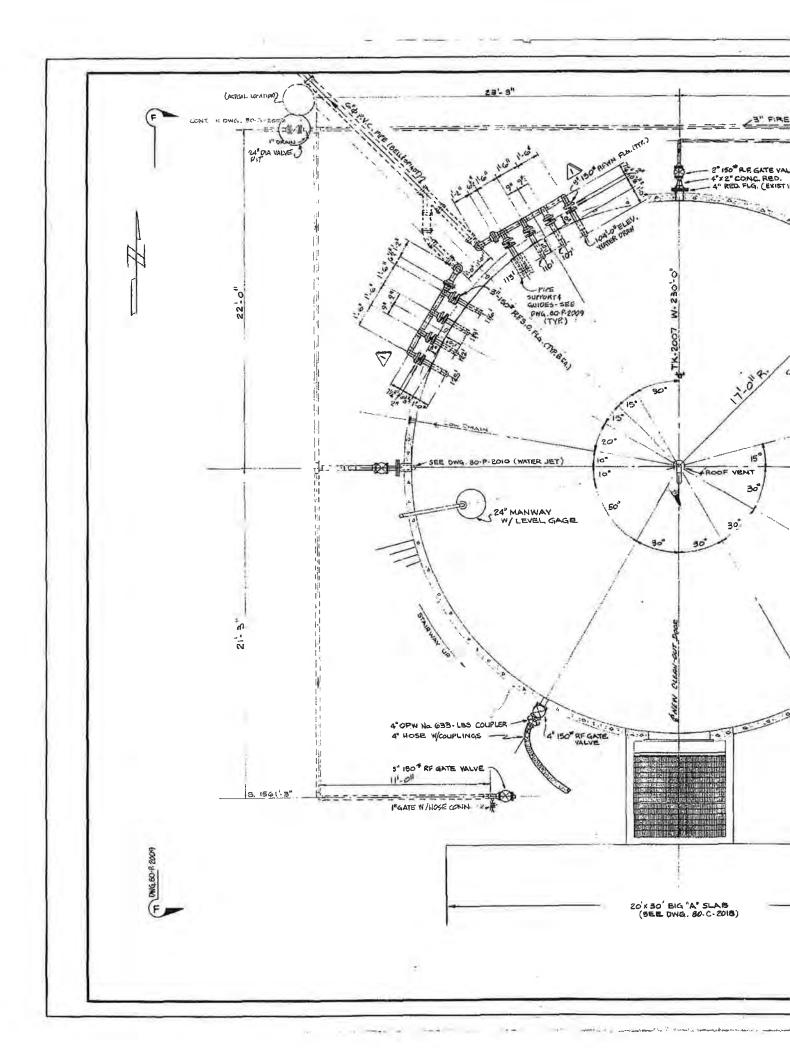


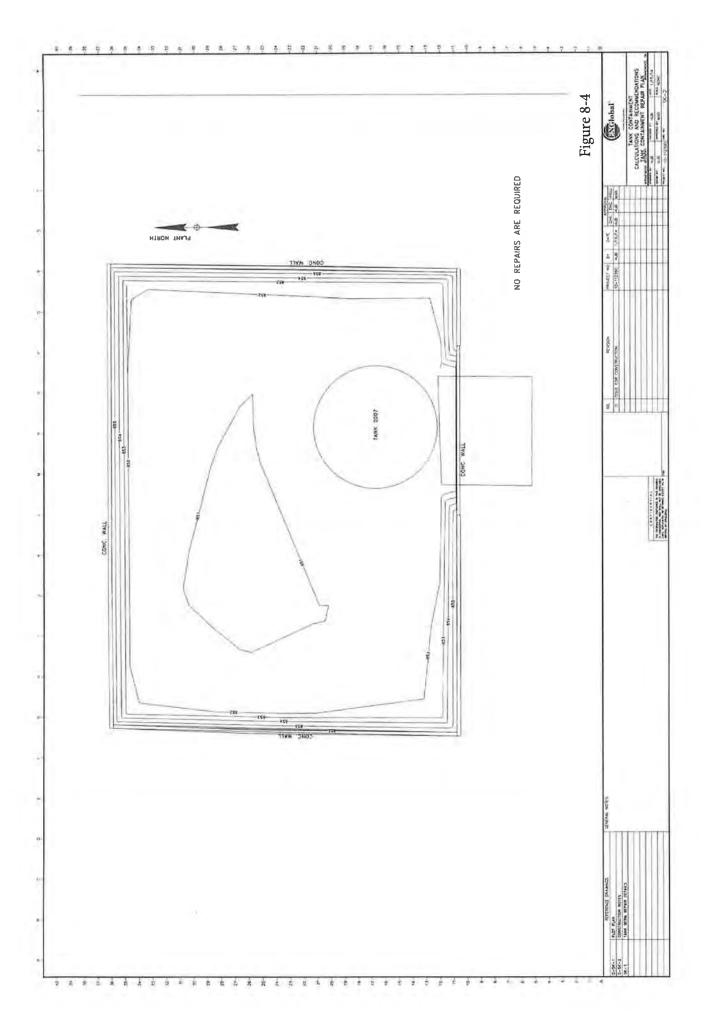


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PIPING PLAN
SCALE: 1'=100'







TCI Tank Consultants, Inc.

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

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 INSP	ECTION EVALUATION
Tank No: 2007	May 25, 2017
Wynnewood, OK	Wynnewood Refining

Table of Contents

Revision History	. 2
Table of Contents	3
Tank Data	. 4
Evaluation Summary	. 5
General	<u>.</u> 5
Foundation	. 5
External Shell	. 6
External Roof	. 6
Access Structures	. 6
Appendix	. 7

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 EXTERNA	TANK INSPECTION EVALUATION	
Tank No: 2007	May 25	, 2017
Wynnewood, OK	Wynnewood Re	fining

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 INS	PECTION 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 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 INSPE	CTION 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

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Customer City, ST		ood Refining WYNN				Inspected	05.25				
Scope	Wynnewo EXTERNAL		Loca	ition			Job No	TC9			
1000								103	031		
Inspecti	on Inform	ation									
lı	nspectors	J. Varner	(API-653 #6	7233) and A	. Majors						
Scope	e of Work	EXTERNA	-								
Tank / N	Vameplate	Informat	ion	Latitude	34.6	5304	Longitude	-97.3			
DIAM	ETER [FT]	35.00	HGT [FT]	29.00	LEN [FT]		BAR	RELS/GALL	ONS		
Circumfer	rence [FT]	109.96	FILL HGT	29.00	Сар	acity	4,9	69	BARREL		
•	Year Built	1949	MFG	Unknown							
Shell	l Material	Unknown									
		Other									
				ost Weld He							
Con	nstruction	O API-65	0 O API-62	0 O API-12C	O API-12F	O UL O STI	O ASME O :	SWRI	nown		
	Standard										
	API	Edition				Appendices					
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	formation			ted around I		9 1					
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'	ialik Type	Other	1 0 11011201	itui O necti	ingle o rott	L O Other					
	lead Type		Dished O F	Hemi O Ellip	tical O Othe	er O None (● N/A				
	ieau Type	○ Flat ○ Dished ○ Hemi ○ Elliptical ○ Other ○ None ● N/A Other									
Fo	nundation		Material O	Grade O Cr	Other ○ Grade Material ○ Grade ○ Crushed Stone ○ Sand/Soil ⑨ Concrete Ringwall ○ Ringwall						
Foundation		○ Concrete Pad ○ Steel Saddles ○ Concrete Saddles ○ Saddles ○ Skids ○ Platform/Legs									
		O Concre	ete Pad O S	teel Saddles							
		O Unkno	ete Pad ○ S wn ○ Othe								
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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 Location	Inspected	05.25.2017		
Scope	EXTERNAL	Job No	TC9831		

Foundation

Foundation Type An	d Details	•	OK	0	NOT OK
	○ Grade Material ○ Grade ○○ Concrete Pad ○ Steel Sado○ Unknown ○ Other				
	Other				
Ringwall Dimensio	ns		MIN [IN]	MAX [IN]	
	Distance From Shell to Edge of		7.5	-9	
	Distance From Top of Ringwa	ill to Grade	5.5	6.5	l)
Saddles		ni. ni.		[FT]	
	Number / Quantity	Distance Betwee	n Saddles From End		1
Anchors	Saddle Width [IN]	Distance	FIOIII EIIU		L
Anchors	Number / Quantity		ОК		
	Bolt Diameter [IN]		Corroded	l threads	
	Spacing [FT]		Loose nu	ts	
oundation Failure	Condition(s)	•	ОК	0	NOT OK
	Obvious Settlement		Grade slop	ed toward ta	nk
	Discontinuous Ringwall		Grade agai	nst tank	
	Broken Concrete		Standing w	ater against	tank
	Exposed Rebar		Void areas	under tank	
	Washed Out Areas				
	Saddle Failure Condition(s)				
	No Pad Plates		Pad Plates	Not Seal We	lded
	Saddle Corrosion				
Housekeeping Arou	nd the Tank	•	ОК	0	NOT OK
	If there is a small amount of de	ebris or vegetation, note in o	omments b	ut do not ch	eck the
	associated boxes.		B 1 2		-11
	Excessive Vegetation			on of dike w	
	Buildup of Debris		Deteriorati	ion of tank b	erm
Foundation Comme	nts				
	Document the locations, sizes, missing concrete, etc.).	and severity of foundation	failure item	s (broken co	ncrete,
The concrete ringwall	had hairline cracks. No rebar w	as exposed.			
There were gaps betw	een the bottom extension and	concrete ringwall up to 1.50	inches wide		
There was moss growi	ng under the bottom extension				

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City, ST	Wynnewood, OK Location	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

External Shell

Shell Insulation			0 0	K	O NOT OK
Type	None	☐ Corrugated			Banded
		☐ Sprayed Foam			
Condition	\bigcirc Like New \bigcirc Good \bigcirc Fair \bigcirc	Poor None			
	Torn	☐ Holes			Areas Not Insulated
External Shell Coatin	ng		® 0	K	O NOT OK
Condition	O Like New © Good O Fair O	Poor O None			
	Peeling	☐ Cracking			Areas Not Coated
	Thin	☐ Stained			
	Describe Coating / Insulation F				
	Document the locations, sizes,		modera	te, sever	e) of any areas of
	coating failure.	•••			
	Document the locations, sizes,	and severity of any a	reas of	bulging, v	vet, or sagging
	insulation, or any other insulat			~	
	There was a 12-inch area of s		chanical	l damage	located 76.70 feet
	counter-clockwise from East 1		ciiaiiicai	i damage	located 70.70 leet
	Counter-clockwise Iroin East	vialiway A.			
	There was section follows on	.h.a. h.a.++a.m. a.v+a.m.ai.a.m			
Comments	There was coating failure on t	the bottom extension.			
	- L L COL III.				
	The bolts of Shell Items A, C,	F, G, H, I, J, K, L, M, and	d V wer	e rust sta	ned.
	There was coating failure on :	Shell Items O and V.			
y					
External Shell Corro	sion		⊚ 0	K	O NOT OK
	Active Corrosion		□ SI	hell Corro	sion
	Inactive Corrosion		□в	ottom Ext	ension Corrosion
	Corrosion Damage				
	Describe Corrosion Problems F	ound			
	If active shell corrosion is pres	ent, document pit dep	oths and	location	s.
	If inactive shell corrosion is pro	esent, document the c	onditio	n of the o	oating in the affected
	areas. Document pit depths ar	d locations.			
	Document the locations, sizes,	and severity of any b	ottom e	extension	corrosion.
Comments					
Eutomol Chall Wolds	Candition(s)		● 0	.V	O NOT OK
External Shell Welds					
	Pinholes			ack of Fus	IUII
_	Cracks			_	Tostad
	Corrosion		<u></u>	Veld Plug	resteu
V	Arc Strikes Describe Weld Problems Found	4			
		_	ald ===	blome	
	Document the locations, sizes,				4
		y inspected from grou	ına leve	ı," "King	r vertical and
	Location Examples: "As visuall	·			
×	horizontal welds," "the extern	·		_ feet co	
×		·		_ feet co	
Comments	horizontal welds," "the extern	·		_ feet co	

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City, ST	Wynnewood, OK Location	Inspected	05.25.2017
Scope	EXTERNAL	Job No	TC9831

External Shell

Shell Distortion and	Buckling	•	ОК	0	NOT OK
	Major Buckles Minor Buckles Describe Shell Distortion and Buckling Pro Document the locations, sizes, and severit or banding at weld joints.	blems Found	Distortion Aro		
Comments					
Shell Improper Cons	struction Practices	•	ОК	0	NOT OK
	Square Corner Insert Plates Weld Spacings not to API STD's Lap Welded Patches Unreinforced Penetrations		Telltale Holes I No Telltale Ho Other		
	Describe Shell Improper Construction Prac List all shell appurtenances that lack repac mechanically plugged repad telltale holes, paint, or repads that lack telltale holes. Note if further engineering review may be	ls or have weld repad telitale	l spacings not to holes clogged w		
Comments	The weld spacings of Shell Nozzles J and)	(did not meet a			
				0	NOT OK
Ground Cables		•	API standards.	0	NOT OR
Ground Cables	The weld spacings of Shell Nozzles J and Document the ground cable locations. Broken Cable	•	API standards.		
Ground Cables Ground Cables Ground Cables	The weld spacings of Shell Nozzles J and Document the ground cable locations. Broken Cable		OK None Found OK		
Ground Cables	The weld spacings of Shell Nozzles J and Document the ground cable locations. Broken Cable Broken Shell Attachment Equipment Manufacturer Type/Model Tape Does Not Have Free Movement	Varec 25 ing Order	OK None Found OK	0	NOT OK
Ground Cables Level Gauge	The weld spacings of Shell Nozzles J and Document the ground cable locations. Broken Cable Broken Shell Attachment Equipment Manufacturer Type/Model Tape Does Not Have Free Movement	● □ Varec 25	OK None Found OK OK	0	NOT OK
Ground Cables Level Gauge	The weld spacings of Shell Nozzles J and Document the ground cable locations. Broken Cable Broken Shell Attachment Equipment Manufacturer Type/Model Tape Does Not Have Free Movement Floats, Guides or Attachments Not in Work	● □ Varec 25	OK None Found OK OK	0	NOT OK

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Customer	Wynnewood Refining	Tank No	2007
City, ST	Wynnewood, OK Location	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 B B Wynnewood, OK Tank: 2007 H G F A B A B P Q DRAWING NOT TO SCALE R W

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.

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Customer V	Wynnewood Refining		Tank No	2007
City, ST	Wynnewood, OK	Location	Inspected	05.25.2017
Scope	EXTERNAL		oN dol	TC9831

A Manway B Thickened Insert C Nozzle D Nozzle E Thickened Insert	[ET]					REPAD [IN]	Desc: TI=Thickened Insert INI	ed Insert	NOZZLE [IN]	WEL	WELD SPACING [IN]
	LOCATION	HEIGHT	SIZE	Ë	SHAPE	MID	HGT	THK	NECK	SPACE	WELD TO ³
Thickened Insert Nozzle Nozzle Thickened Insert	0.00	30.00	24.00		TMB	72.00	54.00	0.499	0.240	00.0	TS
Nozzle Nozzle Thickened Insert	0.00	27.00			TMB	72.00	54.00	0.499		0.00	TS
Nozzle Thickened Insert	4.60	10.50	4.00	1	HEX	15.00	12.00	0.249	0.308	3.75	CW
Thickened Insert	26.50	9.00	4.00		TMB	36.00	32.00	0.498	0.336	0.00	TS
	26.50	16.00			TMB	36.00	32.00	0.498		0.00	TS
Nozzle	35.40	36.00	3.00	1	HEX	14.00	11.00	0.245	0.296	3.25	ŋ
Nozzie	36.95	36.00	3.00	1	HEX	14.00	11.00	0.241	0.298	3.25	Ξ
Nozzle	38.40	36.00	3.00	1	HEX	14.00	11.00	0.236	0.297	3.25	
Nozzle	39.93	36.00	3.00	1	HEX	14.00	11.00	0.247	0.300	3.25	Ŧ
Nozzle	45.35	35.50	3.00	1	HEX	14.00	11.00	0.244	0.301	0.00	M/
Nozzle	46.85	35.50	3.00	1	HEX	14.00	11.00	0.245	0.311	3.75	ſ
Nozzle	48.35	35.50	3.00	1	HEX	14.00	11.00	0.246	0.298	3.75	¥
M Nozzle	49.90	35.50	3.00	Ι	HEX	14.00	11.00	0.239	0.317	3.75	7
Thickened Insert	54.40	12.00			TMB	00.09	24.00	0.400		0.00	TS
Nozzle	54.90	10.00	6.00	T	TMB	00.09	24.00	0.400	0.435	0.00	TS
Level Gauge	57.80										
Stairway Start	61.05										
Nozzle	73.20	8.50	4.00	1	HEX	14.50	12.00	0.244	0.317	1.75	CW
Coupling (R2)	67.18		2.00							11.50	MH
Coupling (R2)	67.18		2.00								
Coupling (R2)	67.18		2.00								
Cleanout Door (48" x 36")	82.40	18.00	36.00	1	TMB	106.00	52.00	0.246	0.496	0.00	TS
W Platform	88.90										
Nozzle	91.50	10.50	9.00	1	HEX	19.50	15.50	0.249	0.430	2.50	ΛO
Nozzle	100.50	6.25	2.00						0.220	4.75	CW

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

Shell Vertical Seams

Vertical S	eam Locatio	ns - 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	•	ОК	O NOT OK
☐ Corrosion			☐ Detached
☐ Buckling			☐ Coating Failure
☐ Broken Welds			□ No Top Angle
Dimensions [IN]	Top Angle	W	ind 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					
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, Expoxy Sealed Rivets.

Total	29.44		Thick	ness [IN] Readi	ngs @	Joint	Nbr	
Ring	Height [FT]	Nominal	Bottom	Middle	Тор	Туре	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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City, ST	Wynnewood, OK	Location	Inspected	05.25.2017
Scope	EXTERNAL		Job No	TC9831

Access Structures				•	ОК	0	NOT OK
	n Welds			Cable Mem	bers		
☐ Bent M	1embers			Corrosion			
☑ Coating	g Failure			Chain Mem	bers		
Stairway							
□ Radial				Spiral			
☐ Catwal	k			Ladder			
Other							
Structure				L.			
☑ Platfor	m			Walkway			
☑ Roof H	andrail						
Other							
	OSHA			EXIS	TING		
DIMENSIONS	REQ	PLATI	FORM	ROOF H	ANDRAIL		
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	r Note ²	1" squ	are bar	1" squ	are bar		
		YES	NO	YES	NO	YES	NO
Midrail Present	1 REQ'D	•	0	•	0	0	0
Slip-Resistant Surfac	e REQ'D	•	0	0	•	0	0
NOTES: ¹ - The spacing of uprig	thts may meet the i	ntentions of th	e OSHA midrail	l requirement. 2	- 2x2x3/8" or 1.5	pipe minim	ım
STAIRWA	AY						
DIMENSIONS OSHA R	EQ EXIS	TING	DIME	NSIONS	OSHA REQ	EXIS	TING
Width [IN] MIN 22	. 28	.00		Width [IN]	MIN 16"		
Rise [IN] / Run [IN]	9.00	9.00	H	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	o-Shell [IN]	MIN 7"		
Upright Member Size NOTE	1" squ	are bar	Rur	ng Size [IN]	MIN 3/4"		
Upright Spacing [IN] MAX 96	5" 9.	50	Rung-To	o-Cage [IN]	27" - 30"		
STAIRWAY Properties	YES	NO	Cage Ve	rticals [IN]	MAX 9.5"		
Midrail ² (REQ'D) 0	0	•	Cage	Hoops [FT]	MAX 8'		
Slip-Resistant (REQ'D) 1	•	0	Rung-to	o-Roof [IN]	1.5" - 12"		
NOTES: 1 - 2x2x3/8" or 1.5" pig	an mainimum 3. The		ights may mas	t the intentions	of the OSHA mid	ail requirem	ont

Access Structures - Describe Problems Found

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

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City, ST	Wynnewood, OK	Location	Inspected	05.25.2017
Scope	EXTERNAL		Job No	TC9831

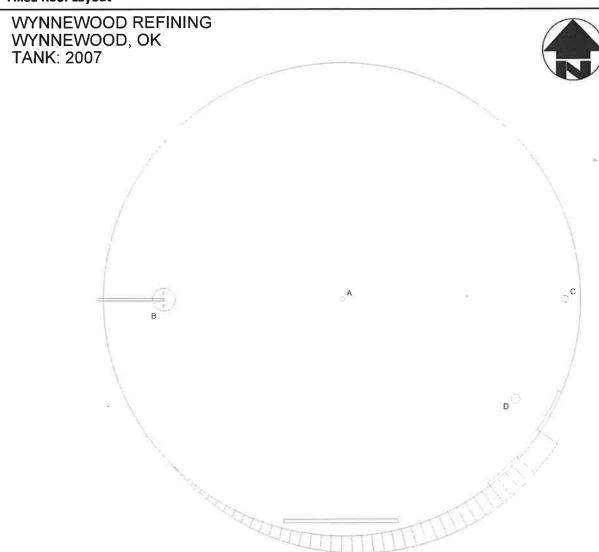
External Fixed Roof - Cone

Adverse Condition(s)		•	ОК	0	NOT OF
	Hole(s)			Excessive W		
	Areas That Hold Water			Corrosion D	amage	
	Active Corrosion					
Coating Condition(s	;)		•	ОК	0	NOT OF
Condition	○ Like New ○ Good ⑨ I	Fair O Poor O Non	e			
	Peeling		☑	Stained		
	Cracking			Insulated		
	Thin					
/enting Type(s), Qu	uantity, Setting(s) and Co	ondition(s)		Quantity	1	
	Missing/Damaged Parts			Flame Arres	stor	
	Screens Missing/Damage	ed .		Corrosion D	amage	
	Painted Closed			Service Ven	ts	
	Unknown Venting					
	Document the reason for	any vent that requ	ires service.			
Number	Vent 1	Vent 2	Ve	nt 3	Ver	nt 4
Туре	Pressure/Vacuum					
Size	8					
Manufacturer	Endaro					
Serial Number	Model 660					
Settings Other	unknown					
	The seal of Roof Pressure	e/Vacuum Vent D v	vas damaged a	nd the cover	was open at	the tim
Misc Comments	of inspection.	•	J		'	
and Clare (As BAss	oured wish a 21 Allows		p: full	1.75	Davis (1913	24
toor Slope (AS Iviea	sured with a 2' - 4' Leve	')	Rise [IN]	1.75	Run [IN]	24
Problem Detail(s)						
	Describe and document a	ny external roof pr	oblems, includ	ling the loca	tion, size, an	d sever
	of the problem for each a	-				
	depths and locations.	•			,	
	,					
Additional Commer	nts					

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City, ST	Wynnewood, OK	Location	Inspected	05.25.2017	
Scope	EXTERNAL	2	Job No	TC9831	

External Fixed Roof - Cone

Fixed Roof Layout



DRAWING NOT TO SCALE

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

External Fixed Roof Fittings

Items Not Coated	Note: Positive radius values are distances from center. Negative
Missing Nuts or Bolts	radius values are distances from shell.

Label	Description	Size	Radius [FT]	Comment
Α	Nozzle	4"	0	blinded
В	Manway	20"	13.08	w/ level gauge couplings blinded
С	Nozzle	6"	16.33	blinded
D	Pressure/Vacuum Vent	8"	14.67	damaged seal
	Tressure, rudulii veite		21.07	admaged sear
	-		+	
	-		-	
	ļ		+	
		_		
	-			
			+	
			-	
-			+	
			-	

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City, ST	Wynnewood, OK	Location	Inspected	05.25.2017
Scope	EXTERNAL		Job No	TC9831

External Roof Thickness Readings

	Radius [FT]	[IN]
Quadrant	Location	Thickness
N	0	0.155
N	5	0.172
N	15	0.173
N	25	0.156
S	0	0.155
S	5	0.153
	15	0.181
S S	25	0.186
E	0	0.157
E	5	0.168
E	15	0.158
Е	25	0.152
W	0	0.154
W	5	0.155
W	15	0.141
W	25	0.161
	1	

Minimum	0.141
Maximum	0.186

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Customer	Wynnewood Refining		Tank No	2007
City, ST	Wynnewood, OK	Location	Inspected	05.25.17
Scope	EXTERNAL		Job No	TC9831

External Survey

Nbr Radials	Spacing [FT]		Survey Starts @		Dire	Product Height [FT]				
8	13.74		ast Manway A		C	CW				
Surve	ey Point	Inverted R		@Bottom Extension		Ring 1	0.00			
Radial	Location [FT]	SetUp 1	SetUp 2	SetUp 3	SetUp 4	Height [FT]	Elevation [FT]			
1	3	4.66								
2	16.74	4.65								
3	30.49	4.64								
4	44.23	4.66	4.92							
5	57.98		4.93							
6	71.72		4.92			V T				
7	85.47		4.95	4.85						
8	99.21			4.81						
9	3			4.79						
				2						
				-						
					(i)					
	E						(
							-			
		1 30								

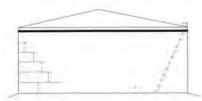
TCI

Tank Consultants, Inc.

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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 Coating Unknown Construction Code

Product API Separator Sludge
Specific Gravity 1.00

Surveyed By

1949

Unknown

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

Table of Contents								
Settlement Evaluation	3							
Settlement Summary Data / Calculations	. 4							
Settlement Charts	. 5							
Field Data	. 7							

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

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

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 (R²) 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.



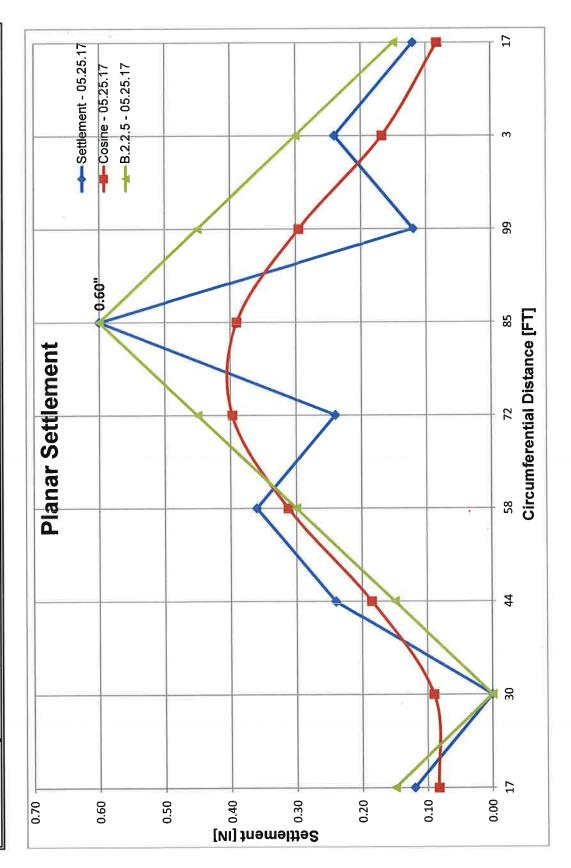
Tank Consultants, Inc. · 4333 West 21st · Tulsa OK 74137 · 918 583-3968 · tank-consultants.com API 653 Appendix B Settlement Summary Data /Calculations Wynnewood Refining - Wynnewood, OK - Tank 2007 Job No - TC9831

																Tot							П			
													-													
									7										100							
			E	1	8																				C.	
						1																				
05.25.17 Elevation	0.02	0.00	-0.01	0.00	-0.03	0.01	0.00	0.01																		
05.25.17 Smax	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72																		
05.25.17 Si	0.03	90.0	0.12	0.24	0.27	0:30	0.12	0.00						1												
05.25.17 B.2.2.5	0:00	0.15	0:30	0.45	09'0	0.45	0:30	0.15																		
05.25.17 Cosine	0.09	0.19	0.31	0.40	0.39	0.29	0.17	0.08																		
05.25.17 Settlement	0.00	0.24	0.36	0.24	09.0	0.12	0.24	0.12															1			
Distance	30.49	44.23	57.98	71.72	85.47	99.21	3.00	16.74													g I			+		
Date Radial	3 6	4	5	9	7	8	1	2	0											X						

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API-653 Tank Settlement Evaluation Report ID - TC9831 Tank - 2007 Settlement Evaluation Report Location - Wynnewood, OK Wynnewood Refining

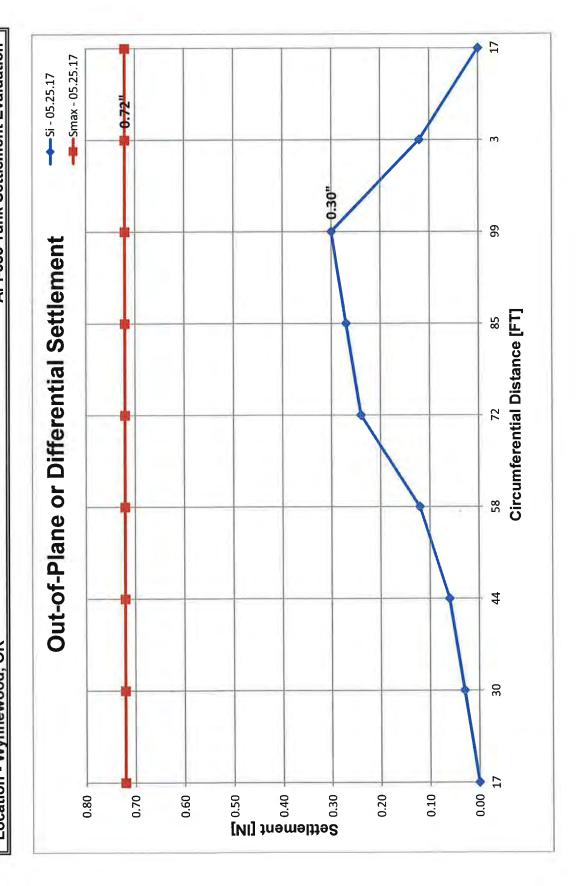
Report Date - 05.25.2017



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

Report ID - TC9831 Report Date - 05.25.2017 API-653 Tank Settlement Evaluation



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Tank Consultants, Inc. \cdot 4333 West 21st \cdot Tulsa OK 74137 \cdot 918 583-3968 \cdot www.tank-consultants.com API 653 Tank Bottom Settlement Data

Customer	Wynnewoo	d Refining		Tank No	2007	
Location	Wynnewoo	d, OK		Date Surveyed	05.25.17	
Surveyed By	J. Varner (A	NPI-653 #67233)	and A. N	Job Number	TC9831	
Tank Diameter	35	[FT]	Radia	l 1 Survey Starts @	East Manway A	
Tank Height	29	[FT]	Survey Di	irection [CW/CCW]	Counter-Clockwise	
Actual Product Level		[FT]		Number of Radials	8	
Foundation Type	Concrete R	ingwall	Actual	Radial Spacing [FT]	13.74	
Fixed Roof Type	Cone		1	nverted Elevations	TRUE	

Radial	Distance		od Readings/Ele			Ring 1 Hgt		ion [FT]	Settleme
Number	(FT)	#1	#2	#3	#4	[IN]	Change	Absolute	[IN]
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	1								
13									
14									
15					8				
16									
17									
18			La	1					
19									
20									
21									
22									
23									
24									
25									
26									
27									
28	100								
29									
30			1-04						
31	1 1								
32									
33	/ 1								
34									
35									
36									
		Ber	chmark Rod Re	ading [FT] @ Se	t Up#		Elevat	ion [FT]	h
		#1	#2	#3	#4		Adjust	BM	
	ВМ						0.00		
Benchmar Descri					*				

Calculations - Minimum Elevation @ Radial, Elevation, Total Settlement

-0.03

7

0.60

			Fill Hei	Fill Height Analysis One-Foot	lysis			-		TCI Tank Consultants, Inc.	Tank C	nsuo	ıltants,	Inc.
Re	To f API-6	determ per / 50 12th	ine the m of Sol API-650 5.1 Ed. (July	To determine the maximum allowable bu 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	To determine the maximum allowable buildup of Solids in Water per API-650 5.6.3 and API-653 4.3.3 I-650 12th Ed. (July '13) and API-653 4th Ed (Nov '13)	v '13)		ob Custo Tar Insp	Job Number: TC9831 Ustomer Name: Wynnewo Location: Wynnewo Tank Number: 2007 Inspection Date: 5/25/2017	Job Number: TC9831 Customer Name: Wynnewood Refining Location: Wynnewood, OK Tank Number: 2007 Inspection Date: 5/25/2017	od Refinin	5		
DESIGN DATA:	DATA:													
35.00 ft	∉.	0.00	0.00 in Diameter	er		4	Number of Shell Rings	653	API Ana	API Analysis (new = 650, existing = 653, pressurized = 620)	350, existing =	653, pre	ssurized = 620	<u> </u>
29.00 ft	€,€,	0.00	0.00 in Height Water 0.50 in Height Solids	Water		1.00	Specific Gravity (Water) Specific Gravity (Solids)	200	°F Design	200 °F Design Temperature	ture			
CALCULATIONS:	ATION	ÿ												
Shell	" I	Shell Height	Solids Fill Ht.	Water Fill Ht.	Plate Material	Allowable	Vertical Seam Type	Joint Eff.	Calculated Minimum	OA	Thickness	ty be	Maximum Fill Height	Fill Ht Check
o N	ř °	Hring (III)	E) 2	H (T)	misson of 1	S (psi)	per API-653 Table 4/2	1 6	1 min (III)	CA (III)	actual (III)	nsed Min	(II)	3
Ring No.	- 2	96.20	5.88	15.96	Unknown	23,595	Unknown Butt-Weld	0.70	0.1227		0.1930	Ε	24.23	ξě
Ring No.	3 8	96.20	0.00	13.82	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1800	Min	29,42	ě
Ring No.	4 7	72.20	00'0	5.80	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1500	Μi	29.42	š
	2	29,22 ft	ft Total Ring Height	g Height						2	Maximum Fill Height: 15 97	Height:		#
		2.50 ir	in Top Angle Height ft Total Shell Height	in Top Angle Height (if any)	(y)			Nomin	Nominal Volume of Solids: Nominal Weight of Solids:	of Solids: of Solids:	12,548 1,174		Cu Ft Kips	
Refer to Al	7-650 5.0	6.3 and A	\PI-653 4.3.	3 for applicat	Refer to API-650 5.6.3 and API-653 4.3.3 for application of the One-Foot method.	nethod.								
For Tmin :	26-(H - 1)-Dia-G	-	fhe fill heigl	ht analysis fo	ound that this tank wa	is adequate fo	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.	1.5) height of 1	13.04 feet an	d a Water (SC	3 = 1) height	t of 29 fe	et.	
, j	SE													

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.

	Öl	Corrosion Rate Analysis	Rate A	nalysis									Tan	TCT Tank Consultants, Inc.	Itants.] [
œ	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 (N	ermine the onic thickr API-653 Se 1 Ed. (July	external in ness insperctions 6.3 '13) and A	To determine the external inspection and ultrasonic thickness inspection interval per API-653 Sections 6.3.2 and 6.3.3 iso 12th Ed. (July '13) and API-653 4th Ed	and val 3 Ed (Nov '13)	_					ال Custo Tan	Job Number: TC9831 Istomer Name: Wynnev Location: Wynnev Tank Number: 2007	Number: TC9831 Per Name: Wynnewood Refi Location: Wynnewood, OK Number: 2007	Job Number: TC9831 Customer Name: Wynnewood Refining Location: Wynnewood, OK Tank Number: 2007		
ESIGN DATA:	ATA:															
35 00 ft 29 00 ft 13 00 ft	411	0.00 in Diameter 0.00 in Height of Water 0.50 in Height of Solids	Water Solids			1.50		API Analysis Specific Gravity (Water) Specific Gravity (Solids)	nter) lids)		5/25/2017	5/25/2017 Date of Inspection	spection			
NALYSIS) This an) This an	INALYSIS CRITERIA:) This analysis was based on long-term corrosion rates using the minimum UT reading per shell course.) This analysis compares the corrosion rate of all shell rings using the One-Foot method.	ed on long-t s the corros	erm corros sion rate of	ion rates us all shell ring	ing the minir s using the	num UT rek One-Foot n	ading per sh	nell course.								
ALCULATIONS	TIONS:															
Shell	Date of	Age of	Joint	Allowable	Allowable Calculated			Long-Term		Short-Term	#	Critical	cal	Remaining	External	5
Course	Construction	Shell (yr)	<u>Щ</u> п	Stress S (psi)	Minimum T _{min}	Nominal	Current T _{actual}	Loss (in)	Rate (in/yr)			Corrosion Rate (in/y)	on Rate (in/yr)	Life (yr)	Interval (yr)	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	2.00	10 00
Ring No. 2	2 1/1/1946	71.39	0.70	23,595	0.1227	0.2188	0.1930	0.0258	0 00036		35	long-term	0.00036	194.53	2.00	15.00
Ring No. 3	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	2.00	15.00
Ring No. 4	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	2.00	15 00

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

Minimum remaining life: 20.00 yr External inspection interval (5 yr max): 5.00 yr Ultrasonic testing interval (16 yr max): 10.00 yr

 Ring No.
 1
 1/1/1946
 71.39

 Ring No.
 2
 1/1/1946
 71.39

 Ring No.
 3
 1/1/1946
 71.39

 Ring No.
 4
 1/1/1946
 71.39

Next external inspection by: May 2022
Next UT reading by: May 2027

To determine the allowable Customer hame: Wightnewood Refining Customer hame: Wightnewood Refining Customer hame: Wightnewood Refining Location: Wightnewood, OK Tank Number: 2007 Inspection Date: 5125/2017 Inspecion Date: 5125/2017 Inspecion Date: 5125/2017 Inspecion Date				ובואוורי	riii neight Affaiysis					LCL Tank Consultants, Inc.	Tank C	onsı	ıltants,	Inc.
Diameter A Number of Shell Rings G53 API Analysis (new = 660, existing = 653, pressurized = 620 Diameter A Number of Shell Rings G53 API Analysis (new = 660, existing = 653, pressurized = 620 Diameter A Diameter A Diameter Diameter	Ref API-	per 650 12t	To de r API-6i th Ed. (termine the product fill 50 5.6.3 an July '13) at		d (Nov '13)		Custo	ob Number: Smer Name: Location: nk Number: section Date:	TC9831 Wynnewo Wynnewo 2007 5/25/2017	od Refinin	B		
Shell Height Fill Height	DESIGN	DATA:												
Product Plate Allowable Seam Type Eff. Minimum Allowance Masarrad Stress Unknown Butt-Weld O.70 O.1543 O.1900 Min 29.42	35.00 29.00 29.00		00.00	n Diamete n Shell He n Liquid L	r i <mark>ght</mark> evel	1.00	Number of Shell Rings Specific Gravity	200	API Ana	lysis (new = 0	550, existing = ture	: 653, pre	ssurized = 620	6
Shell Height Hung (in) Product Fill Ht. Product Material Allowable Stress Vertical Scam Type Vertical Eff. Joint Minimum Calculated Allowance Fill Ht. Corrosion Measured Masured Masured (th) Thickness Measured (th) Unimum Measured (th) Thickness Measured (th) Unimum Measured (th) Measured Measured (th) Type (th) Fill Height (th) Measured Measured (th) Westernal (th) Thickness Measured (th) Unimum Measured (th) Hill Height (th) Measured (th) Westernal (th) Thill Height (th) Measured (th) Thill Height (th) Thill Height (th) Measured (th) Thill Height (th) Measured (th) Thill Height (th) Measured (th) Thill Height (th) Thill Height (th)<	SALCUL	ATIONS	يز											
1 56,00 2 29,00 21,83 Unknown Unknown Butt-Weld 0.70 0.148 0.1930 Min 29,42 29,42 3 96,20 21,83 Unknown 25,960 Unknown Butt-Weld 0.70 0.1000 0.1800 Min 29,42 4 72,20 5,80 Unknown Unknown Butt-Weld 0.70 0.1000 0.1800 Min 29,42 29,22 ft Total Ring Height Apgle Height (if any) Apgle Apgle Apgle CL Ft	Shell	S E E	shell eight	Product Fill Ht. H (ft)	Piate Material	Allowabie Stress S (psi)	Vertical Seam Type per API-653 Table 4.2	Joint Eff.	Calculated Minimum T _{min} (in)	Corrosion Allowance CA (in)	Thickness Measured T _{actual} (in)	UT type used	Maximum Fill Height (ft)	Fill Ht Check
2 96.20 21.83 Unknown 23.595 Unknown Butt-Weld 0.70 0.1448 0.1930 Min 29.42 3 96.20 13.82 Unknown 25,960 Unknown Butt-Weld 0.70 0.1000 0.1000 Min 29.42 1 29.22 ft Total Ring Height (if any) 25,960 Unknown Butt-Weld 0.70 0.1000 0.1000 Min 29.42 ft 29.22 ft Total Ring Height (if any) Apple Height (if any) Apple Min 29.42 ft 29.42 ft Total Shell Height Total Shell Height Min 29.42 ft	Ring No.	1	00'9	29.00	Unknown	23,595	Unknown Butt-Weld	0.70	0.1543		0.1900	Min	29.42	Š
3 96.20 13.82 Unknown Dutknown Butt-Weld 0.70 0.1000 0.1000 Min 29.42 4 4 72.20 5.80 Unknown Unknown Butt-Weld 0.70 0.1000 0.1000 Min 29.42 1 29.22 ft Total Ring Height (if any) A,969 RBL Cu Ft Cu Ft	Ring No.		6.20	21.83	Unknown	23,595	Unknown Butt-Weld	0.70	0.1148		0.1930	Min	29.42	OK
4 72.20 5.80 Unknown Duft-Weld 0.70 0.1000 0.1000 Min 29.42 # 29.22 ft Total Ring Height (if any) A,969 Maximum Fill Height Cu Ft 29.42 ft Total Shell Height A,969 BBL	Ring No.		6.20	13.82	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1800	Min	29.42	Š
# Total Ring Height Maximum Fill Height: 29.42 In Top Angle Height (if any) ## 1969 BBL ## 1969 BBL	Ring No.		2.20	5.80	Unknown	25,960	Unknown Butt-Weld	0.70	0.1000		0.1500	Min	29.42	š
in Top Angle Height (if any) 27,901 ft Total Shell Height		26		t Total Ring	Height					<	Aaximum Fill	Height:	- 1	#
ff Total Shell Height		2		n Top Angle	Height (if any)				Nomina	I Volume:	27,90		Cu Ft	
		22		ft Total Shell	Height						4,908		DDL	

For Tmh:

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. 1.6-(H-1)-Dia-G

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.

	ΌΙ	orrosior	Corrosion Rate Analysis	nalysis			2				IC	I Tan	TCI Tank Consultants, Inc.	Itants, I	Inc.
, a	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 (N	ermine the onic thickr API-653 Se h Ed. (July	external ir ness insper ections 6.3. '13) and Al	To determine the external inspection and ultrasonic thickness inspection interval per API-653 Sections 6.3.2 and 6.3.3 iso 12th Ed. (July '13) and API-653 4th Ed	and 7al 5 Ed (Nov '13)						Job Number: TC9831 Customer Name: Wynnewood Refining Location: Wynnewood, OK Tank Number: 2007	Number: TC9831 Ter Name: Wynnewood Refi Location: Wynnewood, OK Number: 2007	od Refining od, OK		
ESIGN DATA:	ITA:														
35 00 ft 29.00 ft 29.00 ft	111	0.00 in Diameter 0.00 in Shell Height 0.00 in Liquid Level	e z			653 200 1.00	653 API Analysis 200 °F Design Temperature 100 Specific Gravity	sis Temperatu Sravity	ē	5/25	5/25/2017 Date of Inspection	spection			
NALYSIS	NALYSIS CRITERIA:								į						
) This an∉ !) This an∉	This analysis was based on long-term corrosion rates using the minimum UT reading per shell course. This analysis compares the corrosion rate of all shell rings using the One-Foot method.	ed on long-t s the corros	term corrosi sion rate of	ion rates us all shell ring	ing the minir ys using the	mum UT re One-Foot r	ading per st riethod.	nell course.							
SALCULATIONS:	ions:														
Shell	Date of	Age of	Joint	Allowable	Calculated			Long-Term		Short-Term	Crit	Critical	Remaining	External	TU
Course	Construction	Shell (yr)	E#.	Stress S (psi)	Minimum T _{min}	Nominal	Current T _{actual}	Loss (in)	Rate (in/yr)		Corrosi	Corrosion Rate (in/yr)	E.	Interval (yr)	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	68'36	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	2 00	15.00
		Minimum re	Minimum remaining life:	84.85	Į,										
	External inspection interval (5 yr max):	ction interva	1 (5 yr max):	5.00	5						Next external inspection by: May 2022	nspection by:	May 2022		
	Ultrasonic testing interval (15 yr max):	sting interval	(15 yr max):	15.00	4						Next U	Next UT reading by: May 2032	May 2032		

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

Hydrostatic Testing One-Foot

TCI Tank Consultants, Inc.

Job Number: TC9831

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) Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

Inspection Date: 5/25/2017

DESIGN DATA:

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

29.42

653 API Analysis (new = 650, existing = 653)

°F Design Temperature 200

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	ок
Ring No.	2	96.20	21.83	Unknown	25,960	0.70	0.1043		0.1930	29.00	ок
Ring No.	3	96.20	13.82	Unknown	27,000	0.70	0.1000		0.1800	29,00	ок
Ring No.	4	72.20	5,80	Unknown	27,000	0.70	0.1000		0.1500	29.00	ок

29.22 ft Total Ring Height

in Top Angle Ht. (if any) 2.50 ft Total Shell Ht

Nominal Volume:

27,901 Cu Ft

4,969 BBL

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

NOTES:

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

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

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Version

Maximum Test Height: 29.00 ft

1.33

Roof Hitch Suitability

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

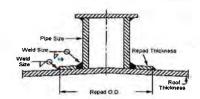
Customer Name: Wynnewood Refining

Location: Wynnewood, OK

Tank Number: 2007

Nozzle: Roof Pressure/Vaccum Vent A

A repad is present.



	Input		vvnere	
	4	in	d _p	Pipe Diameter
	0.177	in	t _p	Thickness of Pipe
Ξ	0.250	in	\mathbf{w}_{p}	Size of Pipe-to-Roof/Repad Weld
Ξ	0.250	in	\mathbf{w}_{r}	Size of Roof-to-Repad Weld
	0.155	in	t ₁	Thickness of Roof
Σ	35.00	in	d_r	Diameter of Repad
	0.248	in	t ₂	Thickness of Repad

Constants		Where	
5000	lbf	L	Horizontal Load on Scaffold Hitch
1.00	in	h	Height of Rope Above Roof Plate
AISC-ASD		SF	Safety factor
29000	ksi	Ε	Modulus of Elasticity of steel
33	ksi	F_{yp}	Minimum Yield Stress of Pipe
30	ksi	F _{vpl}	Minimum Yield Stress of Plate

Output	vvnere	
5.00 in-kips	М	Moment on Structure
4.50 in	d_{o}	Outer Pipe Diameter
4.17 in	d _i	Inner Pipe Diameter
0.16 in	t_{pd}	Design Thickness of Pipe
2.24 in ²	Ap	Cross Section Area of Pipe
2.344 in ³	Z	Elastic Section Modulus of Pipe
3.095 in ³	Zp	Plastic Section Modulus of Pipe
13.291 kips	Vn/SF	Allowable Shear Strength for Pipe
61.17 in-kips	Mn/SF	Allowable Flexural Strength for Pipe
0.473 kips/in	W_p	Load Per Inch on Pipe-to-Roof/Repad Weld
0.046 kips/in	W_r	Load Per Inch on Roof-to-Repad Weld
3.182 kips/in	Fw/SF	Allowable Weld Strength Pipe-to-Roof/Repad Weld
3.182 kips/in	Fw/SF	Allowable Weld Strength Roof-to-Repad Weld
7.63	β_1	Formula Constant for Pipe-to-Roof/Repad Interface
0.47	β_2	Formula Constant for Repad-to-Roof Interface
0.2925 in	T	Effective Thickness of Roof plate and Repad
25.50 ksi	σ_{max1}	Maximum Stress on Pipe-to-Roof/Repad Interface
5.06 ksi	σ_{max2}	Maximum Stress on Roof-to-Repad Interface

Will the pipe support the load?	Yes	
Will the weld support the load?	Yes	
Will the pipe-to-roof/repad interface support the load?	No	
Will the roof to repad interface support the load?	Yes	
the structure acceptable for use as a scaffold hitch?	No	

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

TCI SERVICES, INCORPORATED

TCI Tank Consultants, Inc.

TCMS Tank Consultants Mechanical Services, Inc.

TCI EQUIPMENT AND CALIBRATION LOG

Date: _5.25.2017	Date: <u>5.25.2017</u> Tob#: <u>TC9831</u>		Company:	Wynnewood Refining		Location:	Wynnewood, OK	
Job#: <u>TC9831</u>			Tank/Component#:			Component Material:	Carbon	
Magnetic Flux Le	akage F	quipme	nt: □YES ⊠N/A (if	not used) 🗆 Pi	ocedure TO	CI-MFL-1 (Refei	renced for Inspection)	
Model (circle one)		TC2000 or	TC2000 or MST-10		S/N	1		
Date of Function Test			Date	Date		nics S/N		
Unit Final Electronics Module					Time o	of Function Test		
Calibration Scale					Cal Va	lue		
Height Settings: Bridge/Magnets					Sensor	s Bar		
Equipment function	on tested	d and set-	-up for this job by:					
Ultrasonic Test E	quipme	nt: ⊠YE	S N/A (if not used)	⊠ Procedure T	CI-UT-1 (F	Referenced for Ir	ispection)	
Unit Cali	bration	s: (Thick	est and Thinnest B	locks Used –	Start, Mid	-Day and Shut	Down)	
Thickness Meter		⊠YES	□N/A (if not used)	Flaw	Detector	□YES	□YES ⊠N/A (if not used)	
Brand		Olympi		Branc	i			
Model 38 DL P		Plus	Model					
Serial Number 161367		709	Serial Number					
Calibration Date 5.25.201			Calibration Date		Date			
Transducer Serial	#	Black 9	021622	Transducer Serial #				
Transducer Size 0.434				_	Transducer Size			
		5 MHz	Transducer Frequency			MHz		
Couplant Sound S				Couplant				
Cal Block Thickness	Instrument Reading		Time	C	al Block nickness	Instrument Reading	Time	
0.100-0.500	0.100-		9:00 am	1	HUMIUSS	Reading		
0.100-0.500	0.100-		11:00 am					
0.100 0.500	0.100	0.500	11,00 4111	1				
				1 1				
			-	1 -		+		
Calibration Block Brand Serial Number		mpus	used on this job. If r	nore space is N/A	needed, use	e comment secti N/A	on.	
Material		on Steel				-	-	
Number of Steps	5							
Step Increments	0.10	0						
Laser Level YES	S □N/A	(if not use	d)	Total S	Station 🗆	YES ⊠N/A (if no	t used)	
Brand		CST/Be	eroer	Brand				
Model ALHV		oi Boi	- Model	-				
Serial Number 017564				Serial Number		-		
Calibration Date 8/1/2016								
				-	Bute			
Receiver Serial Number 601000165			165	Receiver Serial Number				

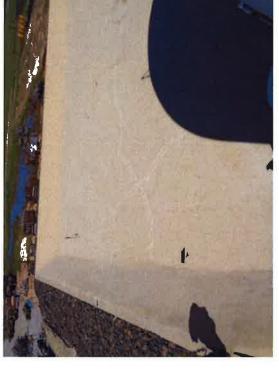
TCI SERVICES, INCORPORATED

TCI Tank Consultants, I	nc.
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TCMS Tank Consultants
Mechanical Services, Inc.

Yoke Brand	Yoke Model
Yoke Serial Number	Yoke Current Type AC
Black Light Source	Black light meets/exceeds 1000 μw/cm ² □YES □NO
Type of Particulate: Wet/Dry / Visible/Fluorescent	Trade Name
Batch #(s)	· <u>·</u>
<u>Vacuum Box</u> □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 Effective Temperature <i>Range</i> °F
Solution Used	3
Example: Seamtest, Windshield Washer Fluid, Sno	op
Is the vacuum box gauge in good condition?	YES □NO
Place vacuum box on weld seam and note vacuum r	reading on gauge
If reading is less than 16" HG, contact Equi	
Using the infrared thermometer, determine the temp	
Floor SURFACE temperature °F A	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	





18

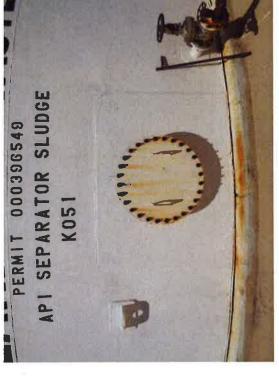
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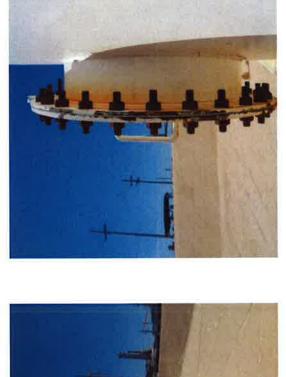
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2A





2C

2D









3A



3C





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4**A**







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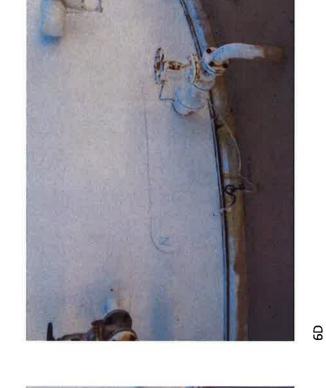


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6A







7A



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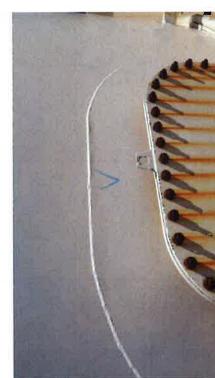


8**A**

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9A

90

90



10A



10D







118

11A



10







12A



12D







13A



13D



TC9831 Wynnewood Refining, Wynnewood, OK Tank 2007



